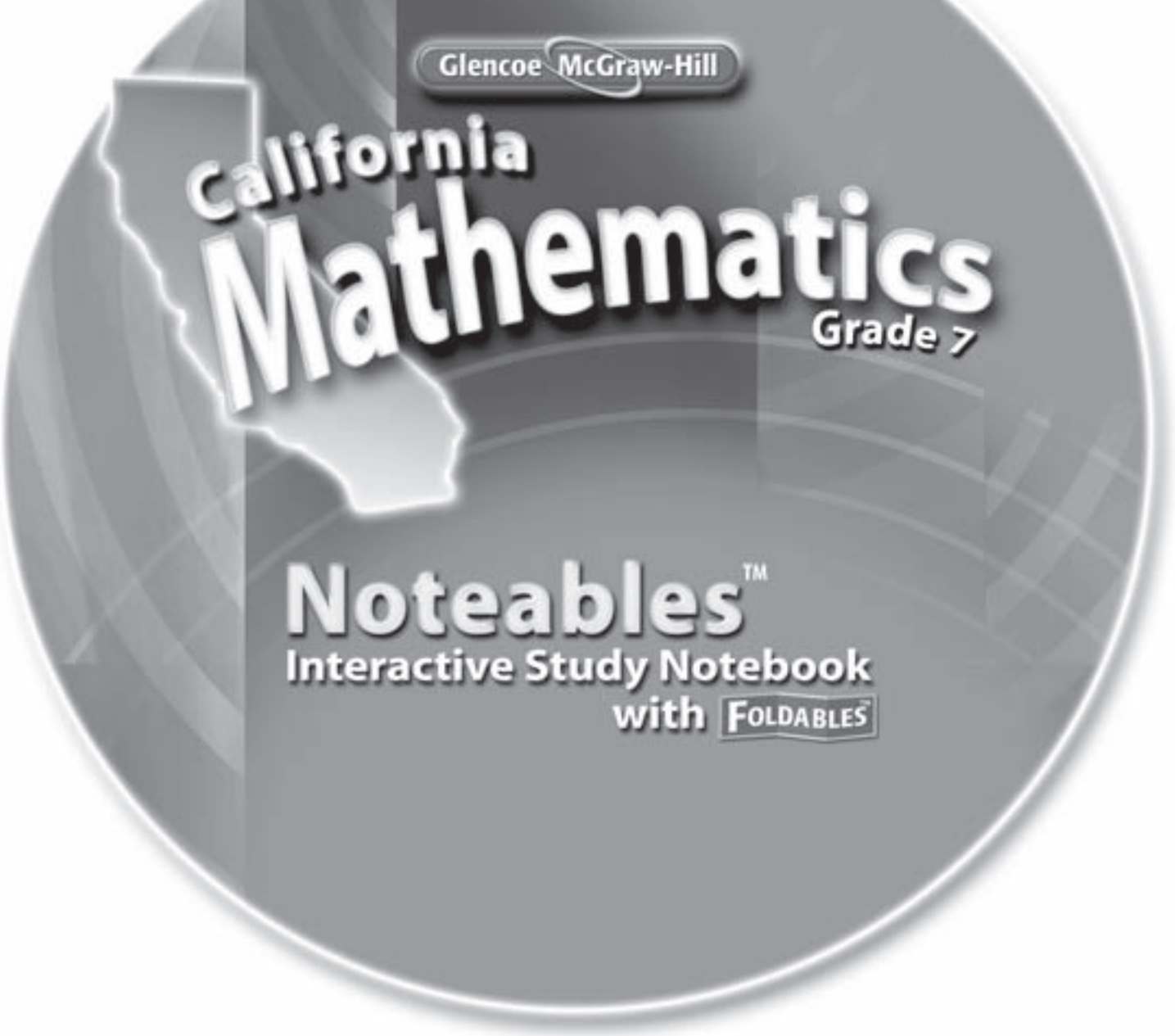


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FOLDABLES™

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California Mathematics Grade 7 (*Student Edition*)
Noteables™: *Interactive Study Notebook with Foldables*™

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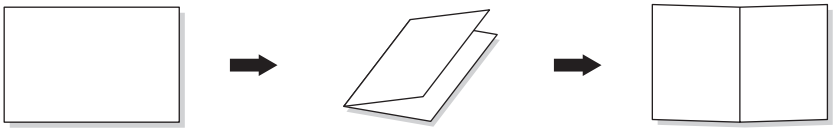
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Organizing Your Foldables

Make this Foldable to help you organize and store your chapter Foldables. Begin with one sheet of 11" × 17" paper.

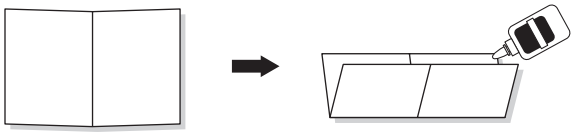
STEP 1 **Fold**

Fold the paper in half lengthwise. Then unfold.



STEP 2 **Fold and Glue**

Fold the paper in half widthwise and glue all of the edges.



STEP 3 **Glue and Label**

Glue the left, right, and bottom edges of the Foldable to the inside back cover of your Noteables notebook.



Reading and Taking Notes As you read and study each chapter, record notes in your chapter Foldable. Then store your chapter Foldables inside this Foldable organizer.

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Using Your Noteables™ with Foldables®
Interactive Study Notebook

This note-taking guide is designed to help you succeed in *California Mathematics* Grade 7. Each chapter includes:

CHAPTER 3

Real Numbers and the Pythagorean Theorem

FOLDABLES Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with two sheets of $8\frac{1}{2}$" by 11" paper.

STEP 1 **Fold** one in half from top to bottom. Cut along fold from edges to margin.

STEP 2 **Fold** the other sheet in half from top to bottom. Cut along fold between margins.

STEP 3 **Insert** first sheet through second sheet and align folds.

STEP 4 **Label** each page with a lesson number and title.

NOTE-TAKING TIP: When you take notes, clarify terms, record concepts, and write examples for each lesson. You may also want to list ways in which the new concepts can be used in your daily life.

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The **Chapter Opener** contains instructions and illustrations on how to make a Foldable that will help you to organize your notes.

A **Note-Taking Tip** provides a helpful hint you can use when taking notes.

CHAPTER 3

BUILD YOUR VOCABULARY

This is an alphabetical list of new vocabulary terms you will learn in Chapter 3. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

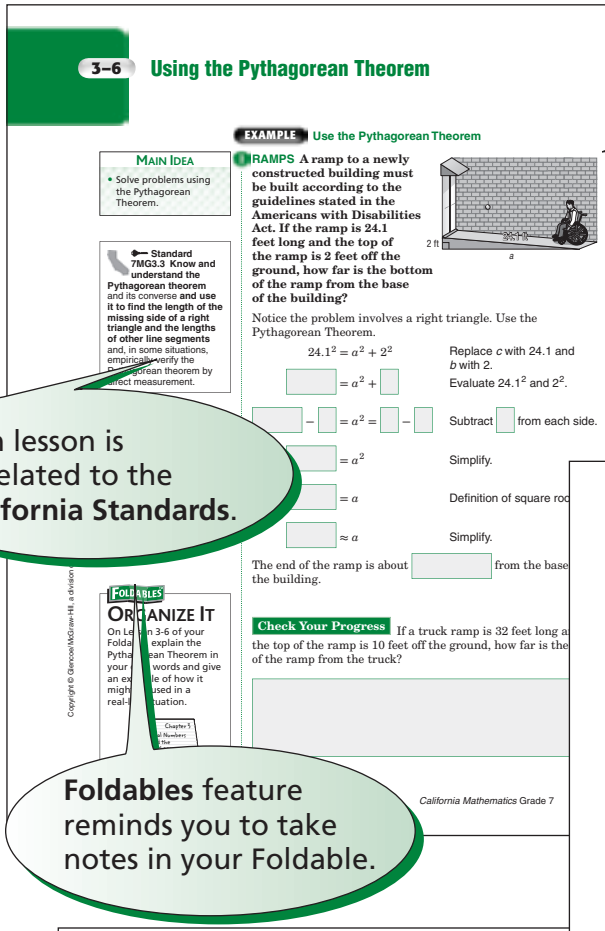
Vocabulary Term	Found on Page	Definition	Description or Example
abscissa [ab-SIH-suh]			
converse			
coordinate plane			
hypotenuse			
irrational number			
legs			
ordered pair			
ordinate [OR-din-it]			
origin			
perfect square			

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Within each chapter, **Build Your Vocabulary** boxes will remind you to fill in this table.

The **Build Your Vocabulary** table allows you to write definitions and examples of important vocabulary terms together in one convenient place.

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3–6 Using the Pythagorean Theorem

EXAMPLE 1 Use the Pythagorean Theorem

MAIN IDEA
- Solve problems using the Pythagorean Theorem.

Standard 7MG3.3 Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.

RAMPS A ramp to a newly constructed building must be built according to the guidelines stated in the Americans with Disabilities Act. If the ramp is 24.1 feet long and the top of the ramp is 2 feet off the ground, how far is the bottom of the ramp from the base of the building?

2 ft

a

Notice the problem involves a right triangle. Use the Pythagorean Theorem.

$24.1^2 = a^2 + 2^2$ Replace c with 24.1 and b with 2.

$\square = a^2 + \square$ Evaluate 24.1^2 and 2^2.

$\square - \square = a^2 = \square - \square$ Subtract $\square$ from each side.

$\square = a^2$ Simplify.

$\square = a$ Definition of square roo

$\square \approx a$ Simplify.

The end of the ramp is about $\square$ from the base the building.

Check Your Progress If a truck ramp is 32 feet long a the top of the ramp is 10 feet off the ground, how far is the of the ramp from the truck?

FOLDABLES ORGANIZE IT

On Le n 3-6 of your Folda explain the Pytha ean Theorem in your words and give an ex le of how it migh used in a real- uation.

Chapter 1 Real Numbers and the Pythagorean Theorem

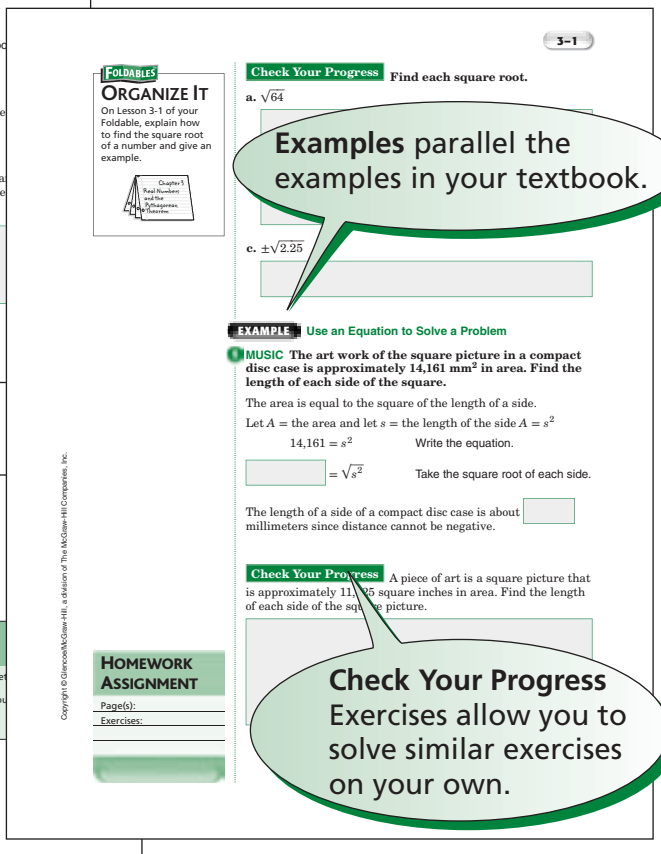
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Lessons cover the content of the lessons in your textbook. As your teacher discusses each example, follow along and complete the fill-in boxes. Take notes as appropriate.

Each lesson is correlated to the Calilfornia Standards.

Foldables feature reminds you to take notes in your Foldable.



3–1

FOLDABLES ORGANIZE IT

On Lesson 3-1 of your Foldable, explain how to find the square root of a number and give an example.

Chapter 1 Real Numbers and the Pythagorean Theorem

Check Your Progress Find each square root.

a. $\sqrt{64}$

c. $\pm\sqrt{2.25}$

EXAMPLE 1 Use an Equation to Solve a Problem

MUSIC The art work of the square picture in a compact disc case is approximately 14,161 mm² in area. Find the length of each side of the square.

The area is equal to the square of the length of a side.

Let A = the area and let s = the length of the side $A = s^2$

$14{,}161 = s^2$ Write the equation.

$\square = \sqrt{s^2}$ Take the square root of each side.

The length of a side of a compact disc case is about $\square$ millimeters since distance cannot be negative.

Check Your Progress A piece of art is a square picture that is approximately 11 25 square inches in area. Find the length of each side of the sq e picture.

HOMEWORK ASSIGNMENT

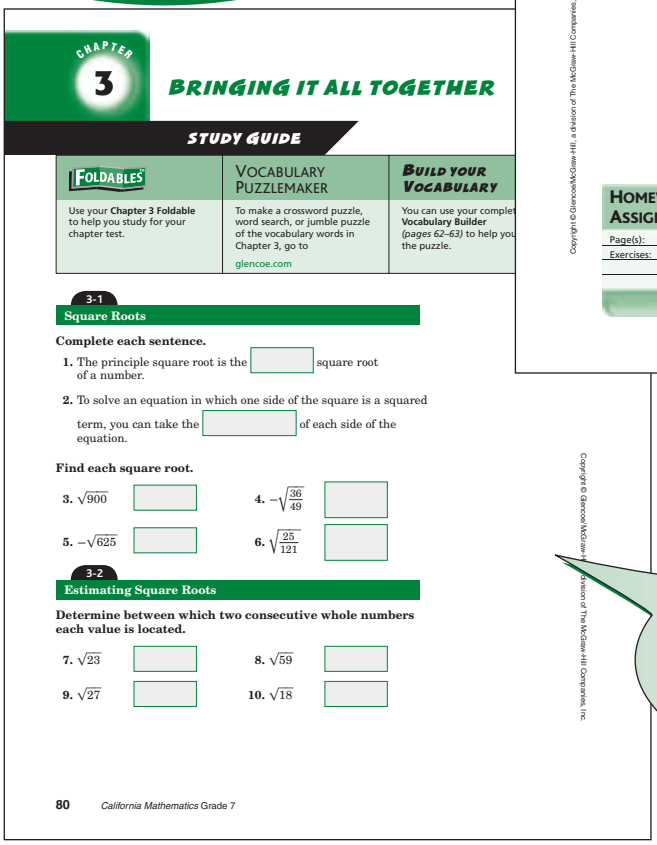
Page(s):

Exercises:

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Examples parallel the examples in your textbook.

Check Your Progress Exercises allow you to solve similar exercises on your own.



CHAPTER 3 BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your Chapter 3 Foldable to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 3, go to glencoe.com	You can use your complet Vocabulary Builder (pages 62–63) to help you the puzzle.

3-1 Square Roots

Complete each sentence.

1. The principle square root is the $\square$ square root of a number.
2. To solve an equation in which one side of the square is a squared term, you can take the $\square$ of each side of the equation.

Find each square root.

3. $\sqrt{900}$ $\square$
4. $-\sqrt{\frac{36}{49}}$ $\square$
5. $-\sqrt{625}$ $\square$
6. $\sqrt{\frac{25}{121}}$ $\square$

3-2 Estimating Square Roots

Determine between which two consecutive whole numbers each value is located.

7. $\sqrt{23}$ $\square$
8. $\sqrt{59}$ $\square$
9. $\sqrt{27}$ $\square$
10. $\sqrt{18}$ $\square$

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Bringing It All Together Study Guide reviews the main ideas and key concepts from each lesson.

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NOTE-TAKING TIPS

Your notes are a reminder of what you learned in class. Taking good notes can help you succeed in mathematics. The following tips will help you take better classroom notes.

- Before class, ask what your teacher will be discussing in class. Review mentally what you already know about the concept.
- Be an active listener. Focus on what your teacher is saying. Listen for important concepts. Pay attention to words, examples, and/or diagrams your teacher emphasizes.
- Write your notes as clear and concise as possible. The following symbols and abbreviations may be helpful in your note-taking.

Word or Phrase	Symbol or Abbreviation	Word or Phrase	Symbol or Abbreviation
for example	e.g.	not equal	$\neq$
such as	i.e.	approximately	$\approx$
with	w/	therefore	$\therefore$
without	w/o	versus	vs
and	+	angle	$\angle$

- Use a symbol such as a star (★) or an asterisk (*) to emphasize important concepts. Place a question mark (?) next to anything that you do not understand.
- Ask questions and participate in class discussion.
- Draw and label pictures or diagrams to help clarify a concept.
- When working out an example, write what you are doing to solve the problem next to each step. Be sure to use your own words.
- Review your notes as soon as possible after class. During this time, organize and summarize new concepts and clarify misunderstandings.

Note-Taking Don'ts

- **Don't** write every word. Concentrate on the main ideas and concepts.
- **Don't** use someone else's notes as they may not make sense.
- **Don't** doodle. It distracts you from listening actively.
- **Don't** lose focus or you will become lost in your note-taking.

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CHAPTER 1

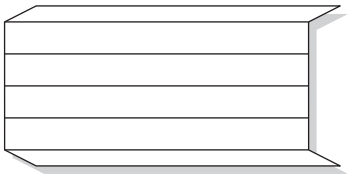
Algebra: Integers

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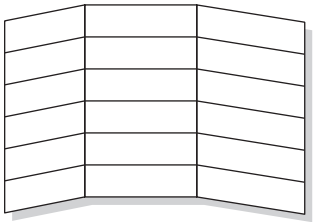
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain piece of 11" × 17" paper.

STEP 1 **Fold** the paper in sixths lengthwise



STEP 2 **Open and Fold** a 4" tab along the short side. Then fold the rest in half.



STEP 3 **Label** Draw lines along the folds and label as shown.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

NOTE-TAKING TIP: When taking notes, it may be helpful to explain each idea in words and give one or more examples.

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CHAPTER 1

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 1. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
absolute value			
additive inverse			
algebra			
algebraic expression [AL-juh-BRAY-ihk]			
conjecture			
coordinate			
counterexample			
define a variable			
equation [ih-KWAY-zhuhn]			
evaluate			
inequality			

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Vocabulary Term	Found on Page	Definition	Description or Example
integer [IHN-tih-juhr]			
inverse operations			
negative number			
numerical expression			
opposites			
order of operations			
positive number			
powers			
property			
solution			
solve			
variable			

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1–1 A Plan for Problem Solving

Main Idea

- Solve problems using the four-step plan.

Build Your Vocabulary (pages 2–3)

Some problem solving strategies require you to make an _____ or conjecture.

Foldables

Organize It

Summarize the four-step problem-solving plan in words and symbols. Include an example of how you have used this plan to solve a problem.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

Standard 7MR1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns. **Reinforcement of Standard 6AF2.3 Solve problems involving rates, average speed, distance, and time.**

Examples Use the Four-Step Plan

1 **HOME IMPROVEMENT** **The Vorhees family plans to paint the walls in their family room. They need to cover 512 square feet with two coats of paint. If a 1-gallon can of paint covers 220 square feet, how many 1-gallon cans of paint do they need?**

EXPLORE Since they will be using _____ coats of paint, we must _____ the area to be painted.

PLAN They will be covering _____ × _____ square feet or _____ square feet. Next, divide _____ by _____ to determine how many cans of paint are needed.

SOLVE _____ ÷ _____ = _____

CHECK Since they will purchase a whole number of cans of paint, round _____ to _____.

They will need to purchase _____ cans of paint.

Check Your Progress Jocelyn plans to paint her bedroom. She needs to cover 400 square feet with three coats of paint. If a 1-gallon can of paint covers 350 square feet, how many 1-gallon cans of paint does she need?

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Remember It



Always check to make sure your answer is reasonable. You can solve the problem again if you think your answer is not correct.

2 **GEOGRAPHY** **Study the table. The five largest states in total area, which includes land and water, are shown. Of the five states shown, which one has the smallest area of water?**

Largest States in Area		
State	Land Area (mi^2)	Total Area (mi^2)
Alaska	570,374	615,230
Texas	261,914	267,277
California	155,973	158,869
Montana	145,556	147,046
New Mexico	121,364	121,598

Source: U.S. Census Bureau

EXPLORE *What do you know?* You are given the total area and the land area for five states. *What are you trying to find?* You need to find the water area.

PLAN To determine the water area, [ ] the [ ] from the [ ] for each state.

SOLVE Alaska = 615,230 − 2 570,374 = [ ]

Texas = 267,277 − 261,914 = [ ]

California = 158,869 − 155,973 = [ ]

Montana = 147,046 − 145,556 = [ ]

New Mexico = 121,598 − 121,364 = [ ]

CHECK Compare the water area for each state to determine which state has the least water area.

[ ] has the least water area with [ ] square miles.

Check Your Progress Refer to Example 2. How many times larger is the land area of Alaska than the land area of Montana?

[ ]

Homework Assignment

Page(s):

Exercises:

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1–2 Variables, Expressions, and Properties

Main Idea

- Solve problems using the four-step plan.

Standard 7AF1.2 Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.
Standard 7AF1.3 Simplify numerical expressions by applying properties of rational numbers (e.g. identity, inverse, **distributive, associative, commutative) and justify the process used.**
Standard 7AF1.4 Use algebraic terminology (e.g. variable, equation, term, coefficient, inequality, **expression,** constant) correctly.

Build Your Vocabulary (pages 2–3)

A **variable** is a _____, usually a letter, used to represent a _____.

An algebraic expression contains a _____, a number, and at least one _____ symbol.

When you substitute a number for the _____, an algebraic expression becomes a **numeric expression.**

To evaluate an expression means to find its _____ value.

To avoid confusion, mathematicians have agreed on a _____ called the **order of operations.**

Key Concept

Order of Operations

1. Do all operations within grouping symbols first; start with the innermost grouping symbols.
2. Evaluate all powers before other operations.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

Examples Evaluate Algebraic Expressions

Evaluate each expression if $q = 5$, $r = 6$, and $s = 3$.

1 $4(r - s)^2$

$4(r - s)^2$

$= 4(\square - \square)^2$ Replace $\square$ with 6 and $\square$ with 3.

$= 4(\square)^2$ Perform operations in the _____ first.

$= 4 \cdot \square$ Evaluate the _____.

$= \square$ Simplify.

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BUILD YOUR VOCABULARY (pages 2–3)

Expressions such as 7^2 and 2^3 are called powers and represent repeated ____.

2 $q^2 - 4r - 1$

$q^2 - 4r - 1 = \square^4 - 4\square - 1$ Replace $\square$ with 5 and $\square$ with 6.

$= \square - 4(6) - 1$ Evaluate ____ before other operations.

$= 25 - \square - 1$ ____.

$= \square - \square$ Add and subtract in order from left to right.

$= \square$ ____.

3 $\frac{6q}{5s}$

The fraction bar is a grouping symbol. Evaluate the expressions in the numerator and denominator separately before dividing.

$\frac{6q}{5s} = \frac{6\ (5)}{5\ (3)}$ Replace $\square$ with 5 and $\square$ with 3.

$= \frac{30}{15}$ Do all ____ first.

$= \square$ ____.

Check Your Progress **Evaluate each expression.**

a. $5p - 3s + 2$ if $p = 2$ and $s = 1$

b. $b^2 + 3c - 5$ if $b = 4$ and $c = 2$

c. $\frac{3s}{q + 4}$ if $q = 2$ and $s = 4$

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BUILD YOUR VOCABULARY (pages 2–3)

A mathematical sentence that contains an sign (=) is called an **equation.**

An equation that contains a _____ is an **open sentence.**

Properties are _____ sentences that are true for any numbers.

A **counterexample** is an example that shows that a conjecture is _____.

REMEMBER IT

Commutative Property

$a + b = b + a$
$a \cdot b = b \cdot a$

Associative Property

$a + (b + c) = (a + b) + c$
$a \cdot (b \cdot c) = (a \cdot b) \cdot c$

Distributive Property

$a(b + c) = ab + ac$
$a(b - c) = ab - ac$

Identity Property

$a + 0 = a$
$a \cdot 1 = a$

EXAMPLES Identify Properties

4 **Name the property shown by $12 \cdot 1 = 12$.**

Multiplying by 1 does not change the number.

This is the _____ Property.

Check Your Progress Name the property shown by $3 \cdot 2 = 2 \cdot 3$.

_____

EXAMPLES Find a Counterexample

5 **State whether the following conjecture is *true* or *false*. If *false*, provide a counter example.**

The sum of an odd number and an even number is always odd.

This conjecture is _____.

Check Your Progress State whether the following conjecture is *true* or *false*. If false, provide a counterexample.

Division of whole numbers is associative.

_____

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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1–3 Integers and Absolute Values

Standard 7NS2.5 Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.

MAIN IDEA

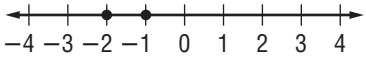
- Graph integers on a number line and find absolute value

BUILD YOUR VOCABULARY (pages 2–3)

A negative number is a number _____ than zero. _____ numbers positive numbers and _____ are members of the set of integers.

EXAMPLE **Compare Two Integers**

1 Replace the ● with < or > to make −2 ● −1 a true sentence.



The number line shows that −2 is _____ than −1, since it lies to the _____ of −1. So, write −2 _____ −1.

Check Your Progress **Replace each ● with < or > to make a true sentence.**

a. −3 ● 2

b. −4 ● −6

BUILD YOUR VOCABULARY (pages 2–3)

The _____ that corresponds to a _____ is called the coordinate of that point.

A sentence that _____ two different numbers of quantities is called an inequality.

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BUILD YOUR VOCABULARY (pages 2–3)

The absolute value of a number is the distance the number is from ☐ on the number line.

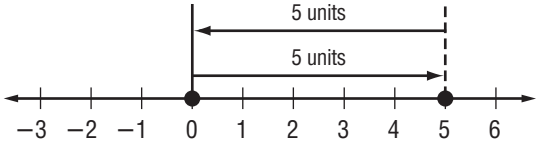
REMEMBER IT

The absolute value of a number is not the same as the opposite of a number. Remember that the absolute value of a number cannot be negative.

EXAMPLES Expressions with Absolute Value

Evaluate each expression.

2 $|5| - |5|$



The graph of 5 is ☐ units from 0 on the number line.

So, $|5| =$ ☐. Then subtract 5 units.

Thus, $|5| - |5| =$ ☐

3 $|6| - |-5|$

$|6| - |-5| =$ ☐ $- |-5|$ The absolute value of 6 is ☐.

$= 6 -$ ☐ $|-5| =$ ☐

$=$ ☐ Simplify.

4 **Evaluate $|6 - 9| - |5 - 3|$.**

$|6 - 9| - |5 - 3| = \left|\square\right| - \left|\square\right|$ Simplify the absolute value expressions.

$=$ ☐ $- |2|$ The absolute value of -3 is ☐.

$= 3 -$ ☐ The absolute value of 2 is ☐.

$=$ ☐ Simplify.

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5 **Evaluate $|x| + 13$ if $|x| = -4$.**

$|x| + 13 = \left|\square\right| + 13$ Replace x with $\square$.

$= \square + 13$ $|-4| = \square$

$= \square$ Simplify.

Check Your Progress **Evaluate each expression.**

a. $|-3| - |3|$ **b.** $|9| - |-6|$ **c.** $|4 - 7| - |11 - 6|$

d. Evaluate $|x| \div 7$ if $x = -2$.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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1–4 Adding Integers

Main Idea

- Add integers.

Standard 7NS1.2 Add, subtract, multiply, and divide rational numbers (**integers,** fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
Standard 7AF1.3 Simplify numerical expressions by applying properties of rational numbers (e.g. identity, inverse, distributive, **associative, commutative**) and justify the process used.

Key Concept

Adding Integers with the Same Sign To add integers with the same sign, add their absolute values. Give the result the same sign as the integers.

EXAMPLE **Add Integers with the Same Sign**

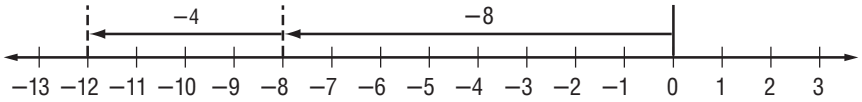
1 **Add $-8 + (-4)$.**

Use a number line.

Start at zero.

Move ____ units to the left.

From there, move 4 units ____.



So, $-8 + (-4) =$ ____.

Check Your Progress **Add using a number line or counters.**

a. $-3 + (-6)$

b. $-13 + (-12)$

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EXAMPLES Add Integers with Different Signs

FOLDABLES™

ORGANIZE IT

Explain and give examples of how to add integers with the same sign and how to add integers with a different signs.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

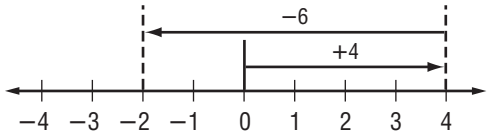
2 **Find 4 + (−6).**

Use a number line.

Start at ____.

Move 4 units ____.

From there, move ____ units left.



So, 4 + (−6) = ____.

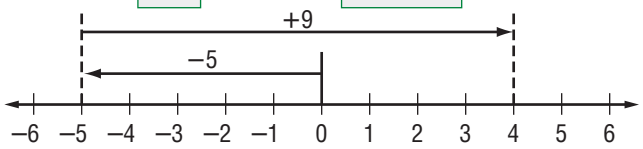
3 **Find −5 + 9.**

Use a number line.

Start at ____.

Move ____ units ____.

From there, move ____ units left ____.



4 **Find −33 + 16.**

−33 + 16 = ____

To find −33 + 16, subtract |16| from |−33|.

The sum is ____

because |−33| > |16|.

KEY CONCEPTS

Adding Integers with Different Signs To add integers with different signs, subtract their absolute values. Give the result the same sign as the integer with the greater absolute value.

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Check Your Progress **Add.**

a. $3 + (-5)$

b. $-6 + 8$

c. $25 + (-15)$.

BUILD YOUR VOCABULARY (pages 2–3)

Two numbers with the same _____ but different signs are called **opposites.**

An integer and its _____ are also called **additive inverses.**

EXAMPLE **Add Three or More Integers**

5 **Find the sum $2 + (-5) + (-3)$.**

$2 + (-5) + (-3) = 2 + [\ \ + (-3)]$ Associative Property

$= 2 +$ Order of operations.

$=$ Simplify.

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Check Your Progress **Find each sum.**

a. $3 + (-6) + (-2)$

b. $-10 + 5 + 10 + 7$

EXAMPLE **Add Three or More Integers**

6 **STOCKS** **An investor owns 50 shares in a video-game manufacturer. A broker purchases 30 shares more for the client on Tuesday. On Friday, the investor asks the broker to sell 65 shares. How many shares of this stock will the client own after these trades are completed?**

Selling a stock decreases the number of shares, so the integer for selling is ____.

Purchasing new stock increases the number of shares, so the integer for buying is ____.

Add these integers to the starting number of shares to find the new number of shares.

$50 + \square + (\square)$

$= (50 + \square) + (\square)$ Associative Property

$= \square + (-65)$ $50 + \square = \square$

$= \square$ Simplify.

Check Your Progress **MONEY** Jaime gets an allowance of $5. She spends $2 on video games and $1 on lunch. Her best friend repays a $2 loan and she buys a $3 pair of socks. How much money does Jaime have left?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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1–5 Subtracting Integers

Standard 7NS1.2 Add, **subtract,** multiply, and divide rational numbers (**integers**, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

MAIN IDEA
- Subtract integers.

EXAMPLES Subtract a Positive Integer

1 **Find 2 – 6.**

$2 - 6 = 2 + (-6)$ To subtract 6, add ☐.

$= \square$ Add.

2 **Find –7 – 5.**

$-7 - 5 = 7 \square (-5)$ To subtract ☐, add –5.

$= -12$ Add.

KEY CONCEPT

Subtracting Integers

To subtract an integer, add its opposite or additive inverse.

EXAMPLES Subtract a Negative Integer

3 **Find 11 – (–8).**

$11 - (-8) = \square - 8$ To subtract –8, add ☐.

$= \square$ Add.

4 **WEATHER The overnight temperature at a research station in Antarctica was –13°C, but the temperature rose 2°C during the day, what was the difference between the temperatures?**

$-13 - 2 = -13 \square \square - 8$ To subtract 2, ☐.

$= -15$ Add.

The difference between the temperatures was ☐.

FOLDABLES

ORGANIZE IT

Record in your Foldable how to subtract integers. Be sure to include examples.

	Words	Example(s)
A Plan for Problem Solving		
+ & – of Integers		
× & ÷ of Integers		
Solving + & – Equations		
Solving × & ÷ Equations		

Check Your Progress **Subtract.**

a. $3 - 7$ ☐

b. $-6 - 2$ ☐

c. $15 - (-3)$ ☐

d. $-7 - (-11)$ ☐

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WRITE IT

Explain why $-b$ does not necessarily mean that the value of $-b$ is negative.

EXAMPLES Evaluate Algebraic Expressions

Evaluate each expression if $p = 6$, $q = -3$, and $r = -7$.

5 **$12 - r$**

$12 - r = 12 - \square$ Replace r with $\square$.

$= 12 + \square$ To subtract $\square$ add $\square$.

$= \square$ Add.

6 **$q - p$**

$q - p = -3 - 6$ Replace q with $\square$ and p with $\square$.

$= -3 + \square$ To subtract $\square$, add $\square$.

$= \square$ Add.

Check Your Progress **Evaluate each expression if $a = 3$, $b = -6$, and $c = 2$.**

a. $10 - c$

b. $b - a$

HOMEWORK ASSIGNMENT

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Exercises:

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1–6 Multiplying and Dividing Integers

Standard 7NS1.2 Add, subtract, **multiply, and divide** rational numbers (**integers**, fractions, and terminating decimals)…whole-number powers. **Standard 7AF1.3 Simplify numerical expressions by applying properties of rational numbers (e.g.** identity, inverse, distributive, **associative, commutative**) and justify the process used.

Main Idea

- Multiply and divide integers.

Key Concepts

Multiplying Two Integers The product of two integers with different signs is negative.

The product of two integers with the same sign is positive.

Dividing Integers The quotient of two integers with different signs is negative.

The quotient of two integers with the same sign is positive.

Remember It

Decide on the sign of the product before multiplying. If the number of negatives is *even* the product is positive. If the number of negatives is *odd* the product is negative.

EXAMPLE 1 Multiply Integers with Different Signs

Find 8 (−4).

$8\,(-4) =$ ☐

The factors have ☐ signs. The product is ☐.

EXAMPLE 2 Multiply Integers with the Same Sign

Find −12 (−12).

$-12(-12) =$ ☐

The factors have the ☐ sign. The product is ☐.

EXAMPLE 3 Multiply More Than Two Integers

Find 6 (−2)(−4).

$6\,(-2)(-4) = [6(-2)]$ ☐ ☐ Property

$= -12$ ☐ $6(-2) =$ ☐

$=$ ☐ $-12(-4) =$ ☐

Check Your Progress

Multiply.

a. $6(-3)$ ☐

b. $-2(6)$ ☐

c. $-8(-8)$ ☐

d. $5(-3)(-2)$ ☐

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EXAMPLE **Divide Integers**

4 **Find $30 \div -5$.**

$30 \div -5 =$ ☐

The dividend and the divisor have ☐ signs.

The quotient is ☐.

Check Your Progress **Divide.**

a. $36 \div (-6)$ ☐

b. $\frac{-30}{5}$ ☐

FOLDABLES™

ORGANIZE IT

Describe why the product or quotient of two integers with the same sign is positive and the product or quotient of two integers with different signs is negative.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

EXAMPLE **Evaluate Algebraic Expressions**

5 **Evaluate $-3x - (-4y)$ if $x = -10$ and $y = -4$.**

$3x - (-4y)$

$= 3($☐$) - [-4($☐$)]$ Replace x with ☐ and y with ☐.

$=$ ☐ $-$ ☐ $(3 - 10) =$ ☐ $-4(-4) =$ ☐

$= -30 +$ ☐ To subtract ☐, add ☐.

$=$ ☐ Add.

Check Your Progress Evaluate $2a - (-3b)$ if $a = -6$ and $b = -4$.

☐

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EXAMPLE **Find the Mean of a Set of Integers**

6 WEATHER **The table shows the low temperature for each month in McGrath, Alaska. Find the mean (average) of all 12 temperatures.**

To find the mean of a set of numbers, find the sum of the numbers. Then divide the result by how many numbers there are in the set.

Average Low Temperatures	
Month	Temp. (°C)
Jan.	−27
Feb.	−26
March	−19
April	−9
May	1
June	7
July	9
Aug.	7
Sept.	2
Oct.	−8
Nov.	−19
Dec.	−26

Source: weather.com

$$\frac{-27 + (-26) + (-19) + (-9) + 1 + 7 + 9 + 7 + 2 + (-8) + (-19) + (-26)}{12}$$

$$= \frac{\square}{12}$$

$$= \square$$

Check Your Progress

The table shows a set of record low temperatures. Find the mean (average) of all 12 temperatures.

Average Low Temperatures	
Month	Temp. (°C)
Jan.	−20
Feb.	−15
March	−5
April	10
May	25
June	31
July	41
Aug.	38
Sept.	34
Oct.	19
Nov.	3
Dec.	−15

Source: weather.com

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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1–7 Writing Equations

MAIN IDEA

- Write algebraic expressions and equations from verbal phrases and sentences.

Standard 7AF1.1 Use variables and appropriate operations to write an expression, **an equation,** an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*. **Standard 7AF1.4 Use algebraic terminology (e.g.** variable, **equation,** term, coefficient, inequality, expression, constant) correctly.

BUILD YOUR VOCABULARY (pages 2–3)

When you choose a variable and an unknown quantity for the variable to represent, this is called **defining the variable.**

EXAMPLE **Write an Algebraic Equation**

1 CONSUMER ISSUES **The cost of a book purchased online plus $5 shipping and handling comes to a total of $29. Write an equation to model this situation.**

Words ▼ Variable ▼ Equation

The price of a book plus $5 shipping is $29.

Let *b* represent the price of the book.

The price of a book	plus	$5 shipping	is $29.
☐	+	☐	= 29

The equation is ☐.

Check Your Progress Write *the price of a toy plus $6 shipping is $35* as an algebraic equation.

☐

EXAMPLE **Write an Equation to Solve a Problem**

2 NUTRITION **A box of oatmeal contains 10 individual packages. If the box contains 30 grams of fiber, write an equation to find the amount of fiber in one package of oatmeal.**

Words ▼ Variable ▼ Equation

Ten packages of oatmeal contain 30 grams of fiber.

Let *f* represent the grams of fiber per package.

Ten packages of oatmeal	contain	30 grams of fiber.
☐	=	30

REMEMBER IT

It is often helpful to select letters that can easily be connected to the quantity they represent. For example, age = *a*.

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REVIEW IT

Explain why it is important to read a word problem more than once before attempting to solve it.

Check Your Progress A particular box of cookies contains 10 servings. If the box contains 1,200 calories, write an equation to find the number of calories in one serving of cookies.

EXAMPLE

3 STANDARDS EXAMPLE **The eighth grade has $35 less in its treasury than the seventh grade has. Given s, the number of dollars in the seventh grade treasury, which equation can be used to find e, the number of dollars in the eighth grade treasury?**

A $e = 35 - s$

B $e = s - 35$

C $e = s \div 35$

D $e = 35s$

Read the Test Item

The phrase *$35 less . . . than the seveth grade* indicates [ ].

Solve the Test Item

The amount of money in the eighth grade century	is	the amount of money in the seventh grade treasury	less	$35
e	$=$	s	$-$	35

The solution is [ ].

Check Your Progress Helena and her friends ordered 3 bags of popcorn and 4 drinks from the snack stand. Which equation could be used to find c, the total cost if p represents the cost of a bag of popcorn and d represents the cost of a drink?

F $c = 7(p + d)$

G $c = 7(p - d)$

H $c = 3p + 4d$

J $c = 7p + 7d$

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1–8 Problem-Solving Investigation: Work Backward

EXAMPLE

MAIN IDEA

- Solve problems by working backward.

Standard 7MR1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns. **Standard 7NS1.2** Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

SCHEDULING **Wendie is meeting some friends for a movie and a dinner. She needs to be finished with dinner by 7:30 P.M. to make it home by 8:00 P.M. The movie runs for 90 minutes, and she wants to have at least 1 hour for dinner. If it takes 20 minutes to get from the theater to the restaurant, what is the latest starting time she can choose for the movie she wants to see?**

EXPLORE You know what time Wendie needs to head home. You know the time it takes for each event. You need to determine _____ _____

PLAN Start with the _____ and work backward.

SOLVE Finish dinner _____ 7:30 P.M.

Go back 1 hour for dinner. _____

Go back _____ for travel. 6:10 P.M.

Go back 90 minutes for the movie. _____

CHECK Assume the movie starts at _____ Work foward, adding the time for each event.

The latest starting time for the movie is _____

Check Your Progress **SHOPPING** Mia spent $9.50 at a fruit stand, then spent three times that amount at the grocery store. She had $7.80 left. How much money did she have initially?

HOMEWORK ASSIGNMENT

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Exercises:

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1–9 Solving Addition and Subtraction Equations

Reinforcement of Standard 6AF1.1 Write and solve one-step linear equations in one variable.

Main Idea

- Solve equations using the Subtraction and Addition Properties of Equality.

Build Your Vocabulary (pages 2–3)

When you **solve** an equation, you are trying to find the values of the variable that makes the equation ____.

A **solution** is the value of the variable that makes the variable ____.

Key Concepts

Subtraction Property of Equality If you subtract the same number from each side of an equation, the two sides remain equal.

Addition Property of Equality If you add the same number to each side of an equation, the two sides remain equal.

EXAMPLE 1 Solve an Addition Equation

Solve $7 = 15 + c$.

METHOD 1 Vertical Method

$7 = 15 + c$ Write the equation.

$7 = 15 + c$ Subtract ____ from each side.

$-15 = -15$

____ $= c$ $7 - 15 =$ ____; $15 - 15 =$ ____

METHOD 2 Horizontal Method

$7 = 15 + c$ Write the equation.

$7 -$ ____ $= 15 + c -$ ____ Subtract ____ from each side.

____ $= c$ $7 - 15 =$ ____; and

____ $- 15 = 0$

Check Your Progress Solve $6 = 11 + a$.

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BUILD YOUR VOCABULARY (pages 2–3)

Addition and subtraction are called **inverse operations** because they "undo" each other.

EXAMPLE Solve an Addition Equation

2 OCEANOGRAPHY **At high tide, the top of a coral formation is 2 feet above the surface of the water. This represents a change of –6 feet from the height of the coral at low tide. Write and solve an equation to determine h, the height of the coral at low tide.**

Words The height at low tide plus the change is the height at high tide.

Variable Let h represent the height at low tide.

Equation $h + (-6) = 2$

$h + -6 = 2$ Write the equation.

$h + (-6) - \square = 2 - \square$ Subtract $\square$ from each side.

$h = \square$ Simplify.

The height of the coral at low tide is 8 feet.

EXAMPLE Solve a Subtraction Equation

3 Solve $-5 = z - 16$.

Use the horizontal method.

$-5 = z - 16$ Write the equation.

$-5 + \square = z - 16 + \square$ Add $\square$ to each side.

$\square = z$ $-16 + 16 = \square$ and $\square + 16 = 11$.

Check Your Progress Solve $x - 12 = 26$.

FOLDABLES

ORGANIZE IT

Compare how to solve an equation involving whole numbers and an equation involving integers.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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1–10 Solving Multiplication and Division Equations

Reinforcement of Standard 6AF1.1 Write and solve one-step linear equations in one variable.

MAIN IDEA

- Solve equations by using the Division and Multiplication Properties of Equality.

KEY CONCEPTS

Division Property of Equality If you divide each side of an equation by the same nonzero number, the two sides remain equal.

Multiplication Property of Equality If you multiply each side of an equation by the same number, the two sides remain equal.

EXAMPLE Solve a Multiplication Equation

1 **Solve $7z = -49$.**

$7z = -49$ Write the equation.

$\frac{7z}{\square} = \frac{-49}{\square}$ ☐ each side by ☐.

☐ z = ☐ $7 \div 7 =$ ☐, $-49 \div 7 =$ ☐

☐ = ☐ Identity Property; $1z =$ ☐

EXAMPLE Solve a Division Equation

2 **Solve $\frac{c}{9} = -6$.**

$\frac{c}{9} = -6$ Write the equation.

$\frac{c}{9}$ ☐ $= -6$ ☐ Multiply each side by ☐.

$c =$ ☐ -6 ☐ = ☐

EXAMPLE Use an Equation to Solve a Problem

3 **SURVEYING English mathematician Edmund Gunter lived around 1600. He invented the *chain*, which was used as a unit of measure for land and deeds. One chain equals 66 feet. If the south side of a property measures 330 feet, how many chains long is it?**

Words

One chain equals 66 feet.

Variable

Let c = the number of chains in ☐ feet.

Equation

Measurement of property	is	66 times the number of chains
330	=	☐

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FOLDABLES

ORGANIZE IT

On your Foldable table, explain how to solve multiplication equations using the multiplication properties of equality.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

Solve the equation.

$330 = 66c$ Write the equation.

$\frac{330}{\square} = \frac{66c}{\square}$ Divide each side by $\square$.

$\square = \square$ $330 \div \square = \square$

The number of chains in 330 feet is $\square$.

Check Your Progress

a. Solve $8a = -64$.

b. Solve $\frac{x}{5} = -10$.

c. Most horses are measured in hands. One hand equals 4 inches. If a horse measures 60 inches, how many hands is it?

HOMEWORK ASSIGNMENT

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CHAPTER 1

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 1 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 1, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 2–3)* to help you solve the puzzle.

1-1

A Plan for Problem Solving

Use the four step plan to solve the problem.

1. Lisa plans to redecorate her bedroom. Each wall is 120 square feet. Three walls need a single coat of paint and the fourth wall needs a double coat. If each can of paint will cover 200 square feet, how many gallons of paint does Lisa need?

1-2

Variables, Expressions and Properties

2. Number the operations in the correct order for simplifying $2 + 4\ (9 - 6 \div 3)$.

☐ addition ☐ subtraction

☐ multiplication ☐ division

3. Describe how the expressions $2 + 5$ and $5 + 2$ are different. Then determine whether the two expressions are equal to each other. If the expressions are equal, name the property that says they are equal.

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1-3

Integers and Absolute Values

Complete each sentence with either *left* or *right* to make a true sentence. Then write a statement comparing the two numbers with either <, or >.

4. −45 lies to the ____ of 0 on a number line. ____

5. 72 lies to the ____ of 0 on a number line. ____

6. −3 lies to the ____ of −95 on a number line. ____

7. 6 lies to the ____ of −7 on a number line. ____

1-4

Adding Integers

Determine whether you *add* or *subtract* the absolute values of the numbers to find the sum. Give reasons for your answers.

8. 4 + 8 ____

9. −3 + 5 ____

10. 9 + (−12) ____

11. −23 + (−16) ____

1-5

Subtracting Integers

Rewrite each difference as a sum. Then find the sum.

12. 2 − 9 ____

13. −3 − 8 ____

14. 10 − (−12) ____

15. −5 − (−16) ____

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1-6

Multiplying and Dividing Integers

Find each product or quotient.

16. $9(-2)$

17. $-6(-7)$

18. $12 \div (-4)$

19. $-35 \div (-7)$

1-7

Writing Expressions and Equations

Determine whether each situation requires *addition*, *subtraction*, *multiplication* or *division*.

20. Find the difference in the cost of a gallon of premium gasoline and the cost of a gallon of regular gasoline.

21. Find the flight time after the time has been increased by 15 minutes.

1-8

Problem Solving Investigation: Work Backward

22. LOANS Alonso bought supplies for a camping trip. He has about $2 left. He spent $15.98 at the grocery store, then spent $21.91 at the sporting goods store. He also spent a third of his money for a deposit on the campsite. About how much money did Alonso have originally?

1-9

Solving Addition and Subtraction Equations

Solve each equation.

23. $x + 6 = 9$

24. $s - 5 = 14$

25. $11 + m = 33$

1-10

Solving Multiplication and Division Equations

Solve each equation.

26. $8r = 32$

27. $3 = \frac{x}{7}$

28. $-9 = -9g$

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CHAPTER 1 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 1.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want take the Chapter 1 Practice Test on page 79 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 1 Study Guide and Review on pages 74–78 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 1 Practice Test on page 79 of your textbook.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 1 Foldable.
- Then complete the Chapter 1 Study Guide and Review on pages 74–78 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 1 Practice Test on page 79 of your textbook.

Student Signature

Parent/Guardian Signature

Teacher Signature

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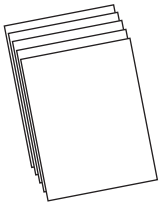
CHAPTER 2

Algebra: Rational Numbers

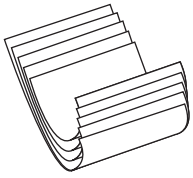
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with five sheets of 8 $\frac{1}{2}$" × 11" paper.

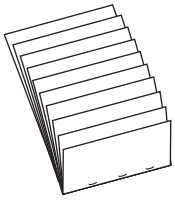
STEP 1 **Place** 5 sheets of paper $\frac{3}{4}$ inch apart.



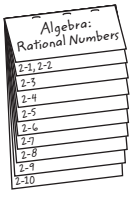
STEP 2 **Roll** up bottom edges. All tabs should be the same size.



STEP 3 **Staple** along the fold.



STEP 4 **Label** the tabs with the lesson numbers.



NOTE-TAKING TIP: As you study a lesson, write down questions you have, comments and reactions, short summaries of the lesson, and key points that are highlighted and underlined.

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CHAPTER 2

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 2. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
bar notation			
base			
dimensional analysis			
exponent			
like fractions			
multiplicative inverses			

(continued on the next page)

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Vocabulary Term	Found on Page	Definition	Description or Example
power			
rational number			
reciprocals			
repeating decimal			
scientific notation			
terminating decimal			
unlike fractions			

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2–1 Rational Numbers



Standard 7NS1.3 Convert fractions to decimals and percents and **use these representations** in estimations, computations, **and applications. Standard 7NS1.5 Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.**

MAIN IDEA

- Express rational numbers as decimals and decimals as fractions.

BUILD YOUR VOCABULARY (pages 33–34)

A **rational number** is any number that can be expressed in the form $\frac{a}{b}$ where a and b are _____ and $b \neq 0$.

A decimal like 0.0625 is a **terminating** decimal because the division ends, or terminates, when the _____ is 0.

KEY CONCEPT

Rational Numbers
A rational number is any number that can be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$.

EXAMPLE 1 **Write a Fraction as a Decimal**

Write $\frac{3}{16}$ as a decimal.

$\frac{3}{16}$ means 3 _____ 16.

$$\begin{array}{r} 0.1875 \\ 16\overline{)3.0000} \\ \underline{16} \\ 140 \\ \underline{128} \\ 120 \\ \underline{112} \\ 80 \\ \underline{80} \\ 0 \end{array}$$

Divide 3 by 16.

Division ends when the _____ is 0.

You can also use a calculator.

The fraction $\frac{3}{16}$ can be written as _____.

Check Your Progress Write $\frac{1}{16}$ as a decimal.

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BUILD YOUR VOCABULARY (pages 33–34)

A _____ like 1.6666 . . . is called a **repeating decimal.**

Since it is not possible to show all of the _____, you can use **bar notation** to show that the 6 _____.

EXAMPLE Write a Mixed Number as a Decimal

2 **Write $-3\frac{2}{11}$ as a decimal.**

You can write $-3\frac{2}{11}$ as $\frac{-35}{11}$ or $\frac{35}{-11}$. To change $-3\frac{2}{11}$ to a decimal, find _____ or _____.

$$
\begin{array}{r}
\text{\_\_\_\_} \\
-11\overline{)35.0000} \\
\underline{-33} \\
20 \\
\underline{-11} \\
90 \\
\underline{-88} \\
20 \\
\underline{-11} \\
90 \\
\underline{-88} \\
2
\end{array}
$$

The remainder after each step is 2 or 9.

The mixed number $-3\frac{2}{11}$ can be written as _____.

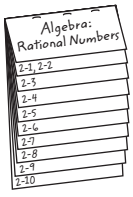
Check Your Progress Write $5\frac{1}{9}$ as a decimal.

WRITE IT

Explain how you decide where the bar is placed when you use bar notation for a repeating decimal.

FOLDABLES ORGANIZE IT

Under the tab for Lesson 2–1, explain in your own words how to express rational numbers as decimals and decimals as fractions.



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EXAMPLE **Write a Terminating Decimal as a Fraction**

3 **Write 0.32 as a fraction.**

$0.32 = \frac{32}{\square}$ 0.32 is 32 $\square$.

$= \square$ Simplify. Divide by the greatest common factor of 32 and 100, $\square$.

The decimal 0.32 can be written as $\square$.

Check Your Progress Write 0.16 as a fraction.

$\square$

EXAMPLE **Write a Repeating Decimal as a Fraction**

4 **ALGEBRA** **Write $2.\overline{7}$ as a mixed number.**

Let $N = 2.\overline{7}$ or 2.777 . . . . Then $10N =$ $\square$.

Multiply N by $\square$ because 1 digit repeats.

Subtract $N = 2.777\ldots$ to eliminate the $\square$ part, 0.777 . . . .

$10N = 27.777\ldots$

$-1N = \ \ 2.777\ldots$ $N = 1N$

$\square = 25$ $10N - 1N = \square$

$\frac{\square}{\square} = \frac{\square}{\square}$ Divide each side by $\square$.

$N = \square$ Simplify.

Check Your Progress Write $1.\overline{7}$ as a mixed number.

$\square$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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2–2 Comparing and Ordering Rational Numbers

Standard 7NS1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10), **compare rational numbers in general.**

MAIN IDEA

Compare and order rational numbers.

EXAMPLE 1 Compare Positive Rational Numbers

Replace ● with <, >, or = to make $\frac{3}{7}$ ● $\frac{8}{13}$ a true sentence.

Write as fractions with the same denominator.

For $\frac{3}{7}$ and $\frac{8}{13}$, the least common denominator is 91.

$$\frac{3}{7} = \frac{3 \cdot \square}{7 \cdot \square} = \frac{\square}{91}$$

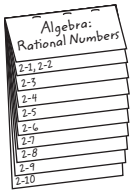
$$\frac{8}{13} = \frac{8 \cdot \square}{13 \cdot \square} = \frac{\square}{91}$$

Since $\frac{\square}{91} < \frac{\square}{91}$, $\frac{3}{7}$ ☐ $\frac{8}{13}$.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 2–2, explain how you can compare two numbers by expressing them as decimals and comparing the decimals.



EXAMPLE 2 Compare Using Decimals

Replace ● with <, >, or = to make 0.7 ● $\frac{7}{11}$ a true sentence.

0.7 ● $\frac{7}{11}$

☐ ● ☐

Express $\frac{7}{11}$ as a decimal.

In the tenths place, 7 > 6.

So, 0.7 ☐ $\frac{7}{11}$.

Check Your Progress **Replace each ● with <, >, or = to make a true sentence.**

a. $\frac{2}{3}$ ● $\frac{3}{5}$

b. $\frac{4}{9}$ ● 0.5

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EXAMPLE **Order Rational Numbers**

REMEMBER IT

On a number line, a number to the left is always less than a number to the right.

3 **CHEMISTRY** **The values for the approximate densities of various substances are shown in the table. Order the densities from least to greatest.**

Write each fraction as a decimal.

$1\frac{4}{5} =$ ____

$2\frac{1}{4} =$ ____

$2\frac{3}{5} =$ ____

Substance	Density (g/cm^3)
aluminum	2.7
beryllium	1.87
brick	$1\frac{4}{5}$
crown glass	$2\frac{1}{4}$
fused silica	$2.\overline{2}$
marble	$2\frac{3}{5}$
nylon	1.1
pyrex glass	2.32
rubber neoprene	$1.\overline{3}$

Source: *CRC Handbook of Chemistry and Physics*

From the least to the greatest, the densities are $1.1, 1.\overline{3}, 1\frac{4}{5}, 1.87, 2.\overline{2}, 2\frac{1}{4}, 2.32, 2\frac{3}{5}$, and 2.7. So, the ____ is the least dense, and ____ is the most dense.

Check Your Progress

The ride times for five amusement park attractions are shown in the table. Order the lengths from least to greatest.

Coaster	Ride Time (min)
Big Dipper	$1\frac{3}{4}$
Double Loop	1.5
Mind Eraser	1.8
Serial Thriller	$2\frac{1}{12}$
X–Flight	$2.\overline{3}$

Source: www.coasterglobe.com

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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2–3 Multiplying Positive and Negative Fractions

Main Idea
- Multiply fractions.

Build Your Vocabulary (pages 33–34)

Dimensional analysis is the process of including units of [ ] when you [ ].

Example **Multiply Fractions**

1 **Find $\frac{3}{7} \cdot \frac{8}{9}$. Write in simplest form.**

$\frac{3}{7} \cdot \frac{8}{9} = \frac{\overset{1}{\cancel{3}}}{7} \cdot \frac{8}{\underset{3}{\cancel{9}}}$ Divide 3 and 9 by their GCF, [ ].

$= \frac{\quad}{\quad}$ ← Multiply the numerators.

← Multiply the denominators.

$= \frac{8}{21}$ Simplify.

Key Concept

Multiply Fractions
To multiply fractions, multiply the numerators and multiply the denominators.

Standard 7NS1.2 Add, subtract, **multiply,** and divide **rational numbers** (integers, **fractions,** and terminating decimals) and take positive rational numbers to whole-number powers.
Standard 7MG1.3 Use measures expressed as rates (e.g. speed, density) and measures expressed as products (e.g. person-days) **to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.**

Example **Multiply Negative Fractions**

2 **Find $-\frac{3}{4} \cdot \frac{7}{12}$. Write in simplest form.**

$-\frac{3}{4} \cdot \frac{7}{12} = -\frac{\overset{1}{\cancel{3}}}{4} \cdot \frac{7}{\underset{4}{\cancel{12}}}$ Divide −3 and 12 by their GCF, [ ].

$= \frac{\quad}{\quad}$ ← Multiply the numerators.

← Multiply the denominators.

$= -\frac{\quad}{\quad}$ The factors have different signs, so the product is negative.

Example **Multiply Mixed Numbers**

3 **Find $3\frac{1}{5} \cdot 1\frac{3}{4}$. Write in simplest form.**

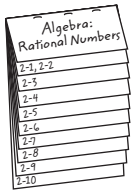
$3\frac{1}{5} \cdot 1\frac{3}{4} = \quad \cdot \quad$ $3\frac{1}{5} = \quad$, $1\frac{3}{4} = \quad$

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FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–3, explain in your own words how to multiply rational numbers.



$= \frac{\overset{4}{\cancel{16}}}{5} \cdot \frac{7}{\underset{1}{\cancel{4}}}$ Divide 16 and 4 by their GCF, ☐.

$= \frac{\square}{5 \cdot 1}$ ← Multiply the numerators. ← Multiply the denominators.

$= \square$, or $5\square$ Simplify.

Check Your Progress **Multiply. Write in simplest form.**

a. $-\frac{2}{15} \cdot \frac{5}{9}$ ☐

b. $3\frac{2}{5} \cdot 2\frac{2}{9}$ ☐

EXAMPLE

4 VOLUNTEER WORK **Last summer the 7th graders performed a total of 250 hours of community service. If the 8th graders spent $1\frac{1}{5}$ this much time volunteering, how many hours of community service did the 8th graders perform?**

The 8 graders spent $1\frac{1}{5}$ times the amount of time as the 7th graders on community service.

$\frac{11}{5} \cdot 250 = \square \cdot \square$

$= \frac{1{,}500}{5}$ or ☐

The 8th graders did ☐ of community service last summer.

Check Your Progress **VOLUNTEER WORK** Last summer the 5th graders performed a total of 150 hours of community service. If the 6th graders spent $1\frac{1}{3}$ this much time volunteering, how many hours of community service did the 6th graders perform?

☐

HOMEWORK ASSIGNMENT

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Exercises:

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2–4 Dividing Positive and Negative Fractions

Standard 7NS1.2 Add, subtract, multiply, and **divide rational numbers** (integers, **fractions,** and terminating decimals). . . **Standard 7MG1.3 Use measures expressed . . . as products (e.g. person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.**

MAIN IDEA
- Divide fractions.

BUILD YOUR VOCABULARY (pages 33–34)

Two numbers whose product is one are **multiplicative inverses.**

The numbers 4 and $\frac{1}{4}$ are _____

or **reciprocals** of each other.

KEY CONCEPTS

Inverse Property of Multiplication The product of a rational number and its multiplicative inverse is 1.

Dividing Fractions To divide by a fraction, multiply by its multiplicative inverse.

EXAMPLE 1 Find a Multiplicative Inverse

Write the multiplicative inverse of $-2\frac{4}{7}$.

$-2\frac{4}{7} =$ _____ Write $-2\frac{4}{7}$ as an improper fraction.

Since $-\frac{18}{7}\left(-\frac{7}{18}\right) =$ _____, the multiplicative inverse of $-2\frac{4}{7}$ is _____.

Check Your Progress

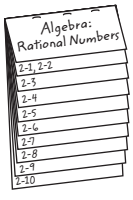
a. Write the multiplicative inverse of $-1\frac{5}{6}$.

_____

FOLDABLES

ORGANIZE IT

On the tab for Lesson 2–4, explain in your own words how to divide rational numbers.



EXAMPLE 2 Divide Negative Fractions

Find $\frac{2}{7} \div -\frac{8}{9}$. Write in simplest form.

$\frac{2}{7} \div -\frac{8}{9} = \frac{2}{7} \cdot$ _____ Multiply by the multiplicative inverse of $-\frac{8}{9}$ which is _____.

$= \frac{\overset{1}{\cancel{2}}}{7} \cdot \frac{9}{\underset{4}{\cancel{8}}}$ Divide 2 and 8 by their GCF, _____.

$=$ _____ The fractions have different signs, so the quotient is negative.

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EXAMPLE **Divide Mixed Numbers**

3 **Find $3\frac{1}{4} \div \left(-2\frac{1}{8}\right)$. Write in simplest form.**

$3\frac{1}{4} \div \left(-2\frac{1}{8}\right) = \square \div \left(\square\right)$ $3\frac{1}{4} = \square$,

$-2\frac{1}{8} = \square$

$= \square \cdot \left(-\frac{8}{17}\right)$ The multiplicative inverse of $\square$ is $-\frac{8}{17}$.

$= \frac{13}{\cancel{4}_{1}} \cdot \left(-\frac{\overset{2}{\cancel{8}}}{17}\right)$ Divide 4 and 8 by their GCF, $\square$.

$= -\frac{26}{17}$ or $\square$ Simplify.

Check Your Progress **Find each quotient. Write in simplest form.**

a. $-\frac{3}{5} \div \frac{9}{10}$

b. $2\frac{1}{3} \div \left(-1\frac{1}{9}\right)$

WRITE IT

Explain how you would divide a fraction by a whole number.

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EXAMPLE

4 PAINTING **It took the five members of the Johnson family $10\frac{1}{2}$ days to paint the 7 rooms in their house. How long will it take the four members of the Reyes family to complete a similar task in their house assuming they work at the same rate?**

If ☐ persons of the Johnson family each worked ☐ days, the project required $5 \times 10\frac{1}{2}$ *person-days* of work. Divide this number by ☐ persons to find the number of days it will take the Reyes family to complete their task.

5 ☐ $10\frac{1}{2}$ person-days $\div$ 4

$= \frac{5 \times 10\frac{1}{2} \text{ person-days}}{1} \times \frac{1}{4 \text{ persons}}$ Multiply by the multiplicative inverse of 4, which is ☐.

$= \frac{52.5}{4}$ or ☐ Simplify.

It will take the Reyes family ☐ days to complete a similar painting task in their house.

Check Your Progress **LAWN CARE** The 6 employees of Love Your Lawn each worked $8\frac{1}{2}$ days to mow 20 lawns. How long will it take the 5 members of Mow Over to complete a similar mowing task assuming they work at the same rate?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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2–5 Adding and Subtracting Like Fractions

Standard 7NS1.2 Add, subtract, multiply, and divide **rational numbers** (integers, **fractions,** and terminating decimals) and take positive rational numbers to whole-number powers.

MAIN IDEA

- Add and subtract fractions with like denominators

BUILD YOUR VOCABULARY (pages 33–34)

Fractions with like [ ] are called **like fractions**.

EXAMPLE **Add Like Fractions**

1 **Find $\frac{3}{16} + \left(-\frac{15}{16}\right)$. Write in simplest form.**

$\frac{3}{16} + \left(-\frac{15}{16}\right) = \frac{\square + \left(\square\right)}{16}$ ← Add the numerators.

← The denominators are the same.

$= \frac{-12}{16}$ or $\square$ Simplify.

EXAMPLE **Subtract Like Fractions**

2 **Find $-\frac{7}{10} - \frac{9}{10}$. Write in simplest form.**

$-\frac{7}{10} - \frac{9}{10} = \frac{\square}{10}$ ← Subtract the numerators.

← The denominators are the same.

$= \frac{-16}{10}$ or $\square$ Rename $-\frac{16}{10}$ as $-1\frac{6}{10}$ or $\square$.

KEY CONCEPTS

Adding Like Fractions To add fractions with like denominators, add the numerators and write the sum over the denominator.

Subtracting Like Fractions To subtract fractions with like denominators, subtract the numerators and write the difference over the denominator.

Check Your Progress **Find each difference. Write in simplest form.**

a. $\frac{2}{9} + \left(-\frac{8}{9}\right)$

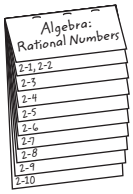
b. $-\frac{7}{8} - \frac{5}{8}$

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FOLDABLES

ORGANIZE IT

Under the tab for Lesson 2–5, record models illustrating the addition and subtraction of like fractions.



EXAMPLE **Add Mixed Numbers**

3 **Find $2\frac{5}{8} + 6\frac{1}{8}$. Write in simplest form.**

$2\frac{5}{8} + 6\frac{1}{8} = \left(\square + \square\right) + \left(\frac{5}{8} + \frac{1}{8}\right)$ Add the whole numbers and fractions separately.

$= \square + \frac{5+1}{8}$ Add the numerators.

$= \square$ or $\square$ Simplify.

EXAMPLE **Subtract Mixed Numbers**

4 **HEIGHTS** **In the United States, the average height of a 9-year-old girl is $53\frac{4}{5}$ inches. The average height of a 16-year-old girl is $64\frac{1}{5}$ inches. How much does an average girl grow from age 9 to age 16?**

$64\frac{1}{5} - 53\frac{4}{5} = \frac{\square}{5} - \frac{\square}{5}$ Write the mixed numbers as improper fractions.

$= \frac{\square - \square}{5}$ ← Subtract the numerators. ← The denominators are the same.

$= \frac{52}{5}$ or $\square$ Rename $\frac{52}{5}$ as $\square$.

The average girl grows $\square$ inches from age 9 to age 16.

Check Your Progress

a. Find $3\frac{3}{10} + 4\frac{1}{10}$. Write in simplest form.

b. Ainsley was $42\frac{1}{7}$ inches tall when she was 4 years old. When she was 10 years old, she was $50\frac{3}{7}$ inches tall. How much did she grow between the ages of 4 and 10?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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2–6 Adding and Subtracting Unlike Fractions



Standard 7NS1.2 Add, subtract, multiply, and divide **rational numbers** (integers, **fractions,** and terminating decimals) and take positive rational numbers to whole-number powers. **Standard 7NS2.2 Add and subtract fractions by using factoring to find common denominators.**

Build Your Vocabulary (pages 33–34)

Main Idea

- Add and subtract fractions with unlike denominators.

Fractions with ____ denominators are called **unlike fractions**.

Examples Add and Subtract Unlike Fractions

Add or subtract. Write in simplest form.

1 $\frac{5}{8} + \left(-\frac{3}{4}\right)$

$\frac{5}{8} + \left(-\frac{3}{4}\right) = \frac{5}{8} + \left(-\frac{3}{4}\right) \cdot$ ____ The LCD is 2 • 2 • 2 or 8.

$=$ ____ $+$ ____ Rename the fractions using the LCD.

$=$ ____ Add the numerators.

$=$ ____ Simplify.

Key Concept

Adding and Subtracting Unlike Fractions To find the sum or difference of two fractions with unlike denominators, rename the fractions with a common denominator. Then add or subtract and simplify, if necessary.

2 $-\frac{7}{96} - \left(-\frac{15}{128}\right)$

$-\frac{7}{96} - \left(-\frac{15}{128}\right) = -\frac{7}{96} \cdot$ ____ $+$ ____ $\cdot \frac{3}{3}$

$96 = 2^{\square} \cdot 3$, $128 = 2^{\square}$

The LCD is $2^7 \cdot 3$ or ____.

$=$ $\frac{\square}{384} + \frac{\square}{384}$ Rename using the LCD.

$=$ $\frac{-28 + 45}{\square}$ Add the numerators.

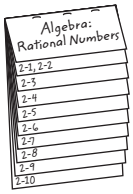
$=$ $\frac{\square}{384}$ Simplify.

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FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–6, record the differences between adding and subtracting like and unlike fractions.



Check Your Progress **Add or subtract. Write in simplest form.**

a. $\frac{5}{6} + \left(-\frac{2}{3}\right)$

b. $\frac{1}{3} - \left(-\frac{3}{5}\right)$

EXAMPLE **Add Mixed Numbers**

3 **Find $-4\frac{1}{8} + 2\frac{5}{12}$. Write in simplest form.**

$-4\frac{1}{8} + 2\frac{5}{12} = \square + \square$ Write the mixed numbers as fractions.

$= -\frac{33}{8} \cdot \frac{3}{3} + \frac{29}{12} \cdot \frac{2}{2}$ The LCD is $2 \cdot 2 \cdot 2 \cdot 3$ or $\square$.

$= \square + \square$ Rename each fraction using the LCD.

$= \frac{\square}{24}$ Add the numerators.

$= \square$ or $1\ \square$ Simplify.

Check Your Progress Find $-5\frac{1}{6} + 3\frac{5}{8}$. Write in simplest form.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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2–7 Solving Equations with Rational Numbers

MAIN IDEA

- Solve equations involving rational numbers.

Standard 7AF1.1 Use variables and appropriate operations to write an expression, **an equation,** an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.
Standard 7NS1.2 Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.

EXAMPLES Solve by Using Addition or Subtraction

1 **Solve $g + 2.84 = 3.62$.**

$g +$ ☐ $= 3.62$ — Write the equation.

$g + 2.84 -$ ☐ $= 3.62 -$ ☐ — Subtract ☐ from each side.

$g =$ ☐ — Simplify.

2 **Solve $-\frac{4}{5} = s - \frac{2}{3}$.**

$-\frac{4}{5} = s - \frac{2}{3}$ — Write the equation.

$-\frac{4}{5} +$ ☐ $= s - \frac{2}{3} +$ ☐ — Add ☐ to each side.

$-\frac{4}{5} +$ ☐ $= s$ — Simplify.

☐ $+ \frac{10}{15} = s$ — Rename each fraction using the LCD.

☐ $= s$ — Simplify.

EXAMPLES Solve by Using Multiplication or Division

3 **Solve $\frac{7}{11}c = -21$.**

$\frac{7}{11}c = -21$ — Write the equation.

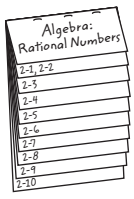
☐ $\left(\frac{7}{11}c\right) =$ ☐ (-21) — Multiply each side by ☐.

$c =$ ☐ — Simplify.

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ORGANIZE IT

Under the tab for Lesson 2–7, summarize in your own words what you have learned about solving equations with rational numbers.



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REVIEW IT

What is a mathematical sentence containing equals sign called? (*Lesson 1–7*)

_____

_____

_____

_____

_____

4 **Solve $9.7t = -67.9$.**

$9.7t = -67.9$ Write the equation.

$\frac{9.7t}{\square} = \frac{-67.9}{\square}$ Divide each side by $\square$.

$t = \square$ Simplify.

Check Your Progress **Solve each equation.**

a. $h + 2.65 = 5.73$

b. $-\frac{2}{5} = x - \frac{3}{4}$.

c. $\frac{3}{5}x = -27$

d. $3.4t = -27.2$

EXAMPLE **Write an Equation to Solve a Problem**

5 **PHYSICS** **You can determine the rate an object is traveling by dividing the distance it travels by the time it takes to cover the distance $\left(r = \frac{d}{t}\right)$. If an object travels at a rate of 14.3 meters per second for 17 seconds, how far does it travel?**

$r = \frac{d}{t}$

$14.3 = \frac{d}{\square}$ Write the equation.

$\square(14.3) = 17\left(\frac{d}{\square}\right)$ Multiply each side by $\square$.

$\square = d$ Simplify.

Check Your Progress If an object travels at a rate of 73 miles per hour for 5.2 hours, how far does it travel?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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2–8 Problem-Solving Investigation: Look for a Pattern

MAIN IDEA

- Solve problems by looking for a pattern.

Standard 7MR2.4 Make and test conjectures by using both **inductive** and deductive **reasoning.**
Standard 7NS1.2 Add, subtract, multiply, and divide rational numbers (**integers,** fractions, and **terminating decimals**) and take positive rational numbers to whole-number powers.

EXAMPLE

1 **INTEREST** **The table below shows the amount of interest $3,000 would earn after 7 years at various interest rates. How much interest would $3,000 earn at 6 percent interest?**

Interest Rate (%)	Interest Earned ($)
1	$210
2	$420
3	$630
4	$840
5	$1,050

EXPLORE You know the amount of interest earned at interest rates of 1%, 2%, 3%, 4%, 5%, and 6%. You want to know the amount of interest earned at 6%.

PLAN Look for a pattern in the amounts of interest earned. Then continue the pattern to find the amount of interest earned at a rate of ____.

SOLVE For each increase in interest rate, the amount of interest earned increases by $210. So for an interest rate of 6%, the amount of interest earned would be $1,050 + $210 = ____.

CHECK Check your pattern to make sure the answer is correct.

Check Your Progress **INTEREST** The table below shows the amount of interest $5,000 would earn after 3 years at various interest rates. How much interest would $5,000 earn at 7 percent interest?

Interest Rate (%)	Interest Earned ($)
1	$150
2	$300
3	$450
4	$600
5	$750

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2–9 Powers and Exponents

Main Idea

- Use powers and exponents in expressions.

Build Your Vocabulary (pages 33–34)

The **base** is the number that is _____.

The **exponent** tells how many times the _____ is used as a _____.

The number that is expressed using an _____ is called a **power.**

Key Concept

Zero and Negative Exponents Any nonzero number to the zero power is 1. Any nonzero number to the negative n power is 1 divided by the number to the nth power.

Standard 7NS1.2 Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and **take positive rational numbers to whole-number powers.**
Standard 7NS2.1 Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.
Standard 7AF2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.

Examples Write Expressions Using Powers

1 **Write $\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot 7 \cdot 7$ using exponents.**

$\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot 7 \cdot 7 =$ _____ $\cdot$ _____ Associative Property

$=$ _____ Definition of exponents

2 **Write $p \cdot p \cdot p \cdot q \cdot p \cdot q \cdot q$ using exponents.**

$p \cdot p \cdot p \cdot q \cdot p \cdot q \cdot q$

$= p \cdot p \cdot p \cdot p \cdot q \cdot q \cdot q$ _____ Property

$= (p \cdot p \cdot p \cdot p) \cdot (q \cdot q \cdot q)$ _____ Property

$=$ _____ $\cdot$ _____ Definition of exponents

Check Your Progress **Write each expression using exponents.**

a. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5$

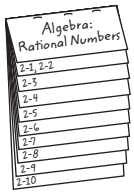
b. $x \cdot y \cdot x \cdot x \cdot y \cdot y \cdot y$

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FOLDABLES™

ORGANIZE IT

On the tab for Lesson 2–9, compare how to evaluate an expression with positive exponents and one with negative exponents.



EXAMPLES **Evaluate Powers**

3 **Evaluate $\left(\frac{3}{4}\right)^5$.**

$\left(\frac{3}{4}\right)^5 =$ ☐ Definition of exponents

$= \frac{243}{1{,}024}$ Simplify.

Check using a calculator.

9 ^ 5 ENTER = ☐

4 **Evaluate 3^{-7}.**

$3^{-7} = \frac{1}{\square}$ Definition of negative exponents

$= \frac{1}{\square}$ Simplify.

5 **ALGEBRA** **Evaluate $x^3 \cdot y^5$ if $x = 4$ and $y = 2$.**

$x^3 \cdot y^5 = \square^3 \cdot \square^5$ Replace x with ☐ and y with ☐.

$= (\square) \cdot (\square)$ Write the powers as products.

$= 64 \cdot 32$ Simplify.

$= \square$ Simplify.

Check Your Progress **Evaluate each expression.**

a. 6^5 ☐

b. 2^{-5} ☐

c. Evaluate $x^2 \cdot y^4$ if $x = 3$ and $y = 4$. ☐

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Page(s):

Exercises:

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2–10 Scientific Notation

Standard 7NS1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10), compare rational numbers in general.

MAIN IDEA
- Express numbers in scientific notation

BUILD YOUR VOCABULARY (pages 33–34)

A number is expressed in **scientific notation** when it is written as a _____ of a factor and a _____ of 10.

KEY CONCEPT

Scientific Notation
A number is expressed in scientific notation when it is written as the product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10.

EXAMPLES Express Numbers in Standard Form

1 **9.62×10^5 in standard form.**

$9.62 \times 10^5 = 962000$

The decimal place moves _____ places to the right.

$=$ _____

2 **Write 2.85×10^{-6} in standard form.**

$2.85 \times 10^{-6} = 0.00000285$

The decimal point moves 6 places to the left.

$=$ _____

Check Your Progress **Write each number in standard form.**

a. 5.32×10^4

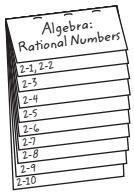
b. 3.81×10^{-4}

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FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–10, collect and record examples of numbers you encounter in your daily life and write them in scientific notation.



EXAMPLES Write Numbers in Scientific Notation

3 **Write 931,500,000 in scientific notation.**

$931500000 = 9.315 \times 100{,}000{,}000$ The decimal point moves 8 places.

$= \square$ The exponent is positive.

4 **Write 0.00443 in scientific notation.**

$0.00443 = \square \times 0.001$ The decimal point moves $\square$ places.

$= 4.43 \times \square$ The exponent is $\square$.

EXAMPLE Compare Numbers in Scientific Notation

5 **PLANETS The following table lists the average radius at the equator for planets in our solar system. Order the planets according to radius from largest to smallest.**

First order the numbers according to their exponents. Then order the numbers with the same exponents by comparing the factors.

Planet	Radius (km)
Earth	6.38×10^3
Jupiter	7.14×10^4
Mars	3.40×10^3
Mercury	2.44×10^3
Neptune	2.43×10^4
Pluto	1.5×10^3
Saturn	6.0×10^4
Uranus	2.54×10^4
Venus	6.05×10^3

Source: *CRC Handbook of Chemistry and Physics*

Jupiter, Neptune, Saturn, Uranus		Earth, Mars, Mercury, Pluto, Venus
STEP 1		
$\square \times 10^4$		6.38×10^3
2.43×10^4		3.40×10^3
6.0×10^4	$>$	2.44×10^3
2.54×10^4		1.5×10^3
		$\square \times 10^3$

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STEP 2

$7.14 \times 10^4 > 6.0 \times 10^4 > 2.54 \times 10^4 > 2.43 \times 10^4$

Jupiter, Saturn, Uranus, Neptune

$6.38 \times 10^3 > 6.05 \times 10^3 > 3.40 \times 10^3 > 2.44 \times 10^3 > 1.5 \times 10^3$

Earth, Venus, Mars, Mercury, Pluto

The order from largest to smallest is _____, Saturn, Uranus, Neptune, Earth, Venus, Mars, Mercury, and _____.

Check Your Progress **Write each number in scientific notation.**

a. 35,600,000

b. 0.000653

c. The table lists the mass for each of the planets in our solar system. Order the planets according to mass from largest to smallest.

Planet	Mass (in tons)
Mercury	3.64×10^{20}
Venus	5.37×10^{21}
Earth	6.58×10^{21}
Mars	7.08×10^{20}
Jupiter	2.09×10^{24}
Saturn	6.25×10^{23}
Uranus	9.57×10^{23}
Neptune	1.13×10^{23}
Pluto	1.38×10^{19}

Source: nssdc.gsfc.nasa.gov

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CHAPTER 2

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 2 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 2, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 33–34)* to help you solve the puzzle.

2-1 Fractions and Decimals

Write each fraction or mixed number as a decimal.

1. $-\frac{3}{4}$ **2.** $3\frac{1}{6}$ **3.** $-7\frac{2}{5}$

Write each decimal as a fraction or mixed number in simplest form.

4. 9.5 **5.** 0.6 **6.** 8.125

2-2 Comparing and Ordering Rational Numbers

Use <, >, or = to make each sentence true.

7. $-\frac{4}{5}$ ☐ $-\frac{2}{3}$ **8.** 4.4 ☐ $4\frac{2}{5}$ **9.** 2.93 ☐ 2.93

Graph each pair of rational numbers on a number line.

10. $\frac{1}{5}, \frac{1}{3}$ **11.** $-\frac{4}{5}, -\frac{9}{10}$

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2-3

Multiplying Rational Numbers

Complete each sentence.

12. The greatest common factor of two numbers is the _____ number that is a _____ of both numbers.

13. Numerators and denominators are _____ by their greatest common factors to _____ the fraction.

Multiply. Write in simplest form.

14. $-\frac{7}{12} \cdot \frac{3}{4}$

15. $4\frac{2}{3} \cdot 5\frac{1}{8}$

2-4

Dividing Rational Numbers

Write the multiplicative inverse for each mixed number.

16. $2\frac{1}{5}$ **17.** $-1\frac{3}{8}$ **18.** $3\frac{4}{7}$

Complete the sentence.

19. To divide by a _____, multiply by its _____ inverse.

20. To _____ a number by $2\frac{1}{5}$, multiply by $\frac{5}{11}$.

2-5

Adding and Subtracting Like Fractions

Determine whether each pair of fractions are like fractions.

21. $\frac{3}{5}, \frac{3}{7}$ **22.** $\frac{5}{8}, \frac{7}{8}$ **23.** $\frac{4}{7}, -\frac{5}{7}$ **24.** $\frac{5}{9}, -\frac{2}{3}$

Add or subtract. Write in simplest form.

25. $\frac{5}{9} - \frac{2}{9}$ **26.** $\frac{5}{8} + \frac{7}{8}$ **27.** $\frac{4}{7} - \frac{5}{7}$

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2-6

Adding and Subtracting Unlike Fractions

Add or subtract. Write in simplest form.

28. $\frac{5}{8} - \frac{7}{12}$ **29.** $\frac{3}{5} + \frac{3}{7}$ **30.** $-\frac{2}{3} + \frac{5}{9}$

2-7

Solving Equations with Rational Numbers

Match the method of solving with the appropriate equation.

31. $25a = 3.75$

32. $\frac{3}{5}m + \frac{7}{10}$

33. $r - 1.25 = 4.5$

34. $\frac{3}{5} + f = \frac{1}{2}$

a. Subtract $\frac{3}{5}$ from each side.

b. Multiply each side by $\frac{5}{3}$.

c. Subtract 3.75 from each side.

d. Add 1.25 to each side.

e. Divide each side by 1.25.

2-8

Problem Solving Investigation: Look for a Pattern

35. **LIFE SCIENCE** The table shows about how many times a firefly flashes at different temperatures. About how many times will a firefly flash when the temperature is 36°C?

Outside Temperature (°C)	Flashes per Minute
16	8
20	9
24	11
28	14

2-9

Powers and Exponents

Evaluate each expression.

36. 5^4 **37.** 6^3 **38.** 2^8

2-10

Scientific Notation

Write each number in scientific notation.

39. 8,790,000 **40.** 0.0000125

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CHAPTER 2 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Math Online

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 2.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want take the Chapter 2 Practice Test on page 139 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 2 Study Guide and Review on pages 134–138 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 2 Practice Test on page 139 of your text book.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 2 Foldable.
- Then complete the Chapter 2 Study Guide and Review on pages 134–138 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 2 Practice Test on page 139 of your textbook.

Student Signature

Parent/Guardian Signature

Teacher Signature

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CHAPTER 3

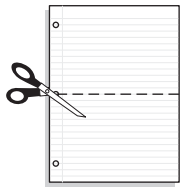
Real Numbers and the Pythagorean Theorem

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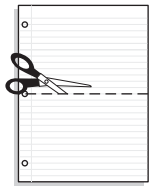
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with two sheets of $8\frac{1}{2}$" by 11" paper.

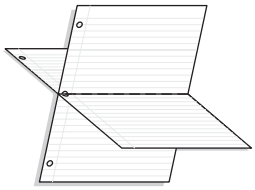
STEP 1 **Fold** one in half from top to bottom. Cut along fold from edges to margin.



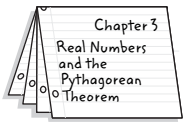
STEP 2 **Fold** the other sheet in half from top to bottom. Cut along fold between margins.



STEP 3 **Insert** first sheet through second sheet and align folds.



STEP 4 **Label** each page with a lesson number and title.



NOTE-TAKING TIP: When you take notes, clarify terms, record concepts, and write examples for each lesson. You may also want to list ways in which the new concepts can be used in your daily life.

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CHAPTER 3

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 3. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
abscissa [ab-SIH-suh]			
converse			
coordinate plane			
hypotenuse			
irrational number			
legs			
ordered pair			
ordinate [OR-din-it]			
origin			
perfect square			

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Vocabulary Term	Found on Page	Definition	Description or Example
Pythagorean Theorem			
quadrants			
radical sign			
real number			
square root			
x-axis			
x-coordinate			
y-axis			
y-coordinate			

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3–1 Square Roots

Standard 7NS2.4 Use the inverse relationship between raising to a power and extracting the root of a perfect square; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.

MAIN IDEA
- Find square roots of perfect squares.

BUILD YOUR VOCABULARY (pages 62–63)

Numbers such as 1, 4, 9, and 25 are called **perfect squares** because they are squares of [ ] numbers.

The [ ] of squaring a number is finding a **square root.**

The symbol $\sqrt{\ }$ is called a **radical sign** and is used to indicate the positive [ ].

A [ ] square root is called the **principal square root.**

KEY CONCEPT

Square Root A square root of a number is one of its two equal factors.

EXAMPLES Find Square Roots

Find each square root.

1 $\sqrt{81}$

$\sqrt{81}$ indicates the [ ] square root of 81.

Since [ ] $= 81$, $\sqrt{81} =$ [ ].

2 $-\sqrt{\frac{16}{81}}$

$-\sqrt{\frac{16}{81}}$ indicates the [ ] square root of $\frac{16}{81}$.

Since [ ] $= \frac{16}{81}$, $-\sqrt{\frac{16}{81}} =$ [ ].

3 $\pm\sqrt{1.44}$

$\pm\sqrt{1.44}$ indicates *both* [ ] square roots of 1.44.

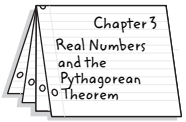
Since [ ] $= 1.44$ and [ ] $= 1.44$, $\pm\sqrt{1.44} = \pm 1.2$, or [ ].

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FOLDABLES™

ORGANIZE IT

On Lesson 3-1 of your Foldable, explain how to find the square root of a number and give an example.



Check Your Progress **Find each square root.**

a. $\sqrt{64}$

b. $-\sqrt{\frac{25}{144}}$

c. $\pm\sqrt{2.25}$

EXAMPLE **Use an Equation to Solve a Problem**

4 **MUSIC** **The art work of the square picture in a compact disc case is approximately 14,161 mm^2 in area. Find the length of each side of the square.**

The area is equal to the square of the length of a side.

Let A = the area and let s = the length of the side $A = s^2$

$14{,}161 = s^2$ Write the equation.

$\square = \sqrt{s^2}$ Take the square root of each side.

The length of a side of a compact disc case is about $\square$ millimeters since distance cannot be negative.

Check Your Progress A piece of art is a square picture that is approximately 11,025 square inches in area. Find the length of each side of the square picture.

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Page(s):

Exercises:

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3–2 Estimating Square Roots

Standard 7NS2.4 Use the inverse relationship between raising to a power and extracting the root of a perfect square; **for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.**

MAIN IDEA
- Estimate square roots.

EXAMPLES Estimate Square Roots

1 **Estimate $\sqrt{54}$ to the nearest whole number.**

The first perfect square less than 54 is ☐.

The first perfect square greater than 54 is ☐.

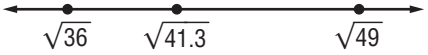
$49 < 54 < 64$	Write an inequality.
$\square < 54 < \square$	$49 = \square$ and $64 = \square$
$\sqrt{7^2} < \sqrt{54} < \sqrt{8^2}$	Take the square root of each number.
$7 < \sqrt{54} < 8$	Simplify.

So, $\sqrt{54}$ is between ☐ and ☐. Since 54 is closer to 49 than 64, the best whole number estimate for $\sqrt{54}$ is ☐.

2 **Estimate $\sqrt{41.3}$ to the nearest whole number.**

- The first perfect square less than 41.3 is 36.
- The first perfect square greater than 41.3 is 49.

Plot each square root on a number line. Then plot $\sqrt{41.3}$.



$36 < 41.3 < 49$	Write an inequality.
$\square < 41.3 < \square$	$36 = \square$ and $49 = \square$
$\sqrt{6^2} < \sqrt{41.3} < \sqrt{7^2}$	Find the square root of each number.
$\square < \sqrt{41.3} < \square$	Simplify.

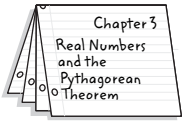
So, $\sqrt{41.3}$ is between ☐ and ☐. Since 41.3 is closer to 36 than 49, the best whole number estimate for $\sqrt{41.3}$ is ☐.

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FOLDABLES™

ORGANIZE IT

On Lesson 3-2 of your Foldable, explain how to estimate square roots.



EXAMPLE **Estimate Square Roots**

3 **FINANCE** **If you were to invest $100 in a bank account for two years, your investment would earn interest daily and be worth more when you withdrew it. If you had $120 after two years, the interest rate, written as a decimal, would be found using the expression $\frac{(\sqrt{120} - 10)}{10}$. Estimate the value.**

First estimate the value of $\sqrt{120}$.

$100 < 120 \quad < 121$ ☐ and ☐ are perfect squares.

$10^2 < 120 \quad < 11^2$ $100 =$ ☐ and $121 =$ ☐

☐ $< \sqrt{120} <$ ☐ Take the square root of each number.

Since 120 is closer to ☐ than 100, the best whole number estimate for $\sqrt{120}$ is ☐. Use this to evaluate the expression.

$$\frac{(\sqrt{120} - 10)}{10} = \frac{(\square - 10)}{10} \text{ or } \square$$

The approximate interest rate is 0.10 or ☐.

Check Your Progress

a. Estimate $\sqrt{65}$ to the nearest whole number.

b. If you were to invest $100 in a bank account for two years, your money would earn interest daily and be worth more when you withdrew it. If you had $250 after two years, the interest rate, written as a decimal, would be found using the expression $\frac{(\sqrt{150} - 10)}{10}$.

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3–3 Problem-Solving Investigation: Use a Venn Diagram

EXAMPLE

MAIN IDEA

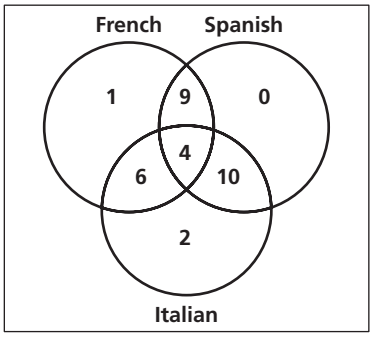
- Solve problems by using a Venn diagram.

Standard 7MR2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, **diagrams,** and models, to explain mathematical reasoning.
Standard 7NS1.2 Add, subtract, multiply, and divide rational numbers (**integers,** fractions, and **terminating decimals**) and take positive rational numbers to whole-number powers.

LANGUAGES Of the 40 foreign exchange students attending a middle school, 20 speak French, 23 speak Spanish, and 22 speak Italian. Nine students speak French and Spanish, but not Italian. Six students speak French and Italian, but not Spanish. Ten students speak Spanish and Italian, but not French. Only 4 students speak all three languages. Use a Venn diagram to find how many exchange students do not speak any of these languages.

EXPLORE You know how many students speak each of the different languages. You want to organize the information.

PLAN Make a Venn Diagram to organize the information.



SOLVE Since 4 students speak all three languages, place a three in the section that represents all three languages. Fill in the other sections as appropriate.

Add the numbers in each region of the diagram:

$1 + 9 + 6 + 4 + 10 + 2 =$ ☐

Since there are 40 exchange students altogether,

$40 - 32 =$ ☐ of them do not speak French,

Spanish, or Italian.

CHECK Check each circle to see if the appropriate number of students is represented.

Check Your Progress **SPORTS** Of the 30 students in Mr. Hall's gym class, 14 play basketball, 9 play soccer, and 11 play volleyball. Three students play basketball and soccer, but not volleyball. One student plays soccer and volleyball, but not basketball. Six students play basketball and volleyball, but not soccer. Only 2 students play all three sports. Use a Venn diagram to find how many students in the class do not play any of these sports.

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3–4 The Real Number System



Standard 7NS1.4 Differentiate between rational and irrational numbers.

MAIN IDEA

- Identify and classify numbers in the real number system.

BUILD YOUR VOCABULARY (pages 62–63)

Numbers that are not _____ are called **irrational numbers.**

The set of rational numbers and the set of _____ numbers together make up the set of **real numbers.**

KEY CONCEPT

Irrational Number An irrational number is a number that cannot be expressed as $\frac{a}{b}$, where a and b are integers and $b \neq 0$.

EXAMPLES Classify Numbers

Name all sets of numbers to which each real number belongs.

1 **0.090909 . . .**

The decimal ends in a _____ pattern.

It is a _____ number because it is equivalent to _____.

2 $\sqrt{25}$

Since $\sqrt{25} =$ _____, it is a _____ number, an _____, and a rational number.

3 $-\sqrt{12}$

Since the decimal does not repeat or _____, it is an _____ number.

Check Your Progress **Name all sets of numbers to which each real number belongs.**

a. 0.1010101010...

b. $\sqrt{64}$

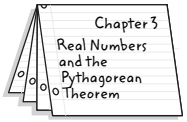
c. $\sqrt{13}$

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On Lesson 3-4 of your Foldable, summarize the properties of the real number system.



EXAMPLES Graph Real Numbers

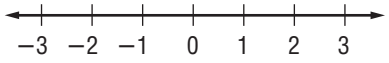
4 **Estimate $\sqrt{8}$ and $-\sqrt{2}$ to the nearest tenth. Then graph $\sqrt{8}$ and $-\sqrt{2}$ on a number line.**

Use a calculator to determine the approximate decimal values.

$\sqrt{8} \approx$ ____

$-\sqrt{2} \approx$ ____

Locate these points on a number line.



$\sqrt{8} \approx$ ____ and $-\sqrt{2} \approx$ ____.

Check Your Progress Estimate $\sqrt{3}$ and $-\sqrt{6}$ to the nearest tenth. Then graph $\sqrt{3}$ and $-\sqrt{6}$ on a number line.

REMEMBER IT



Always simplify numbers before classifying them.

EXAMPLES Compare Real Numbers

Replace each ● with <, >, or = to make a true sentence.

5 **$3\frac{7}{8}$ ● $\sqrt{15}$**

Write each number as a decimal.

$3\frac{7}{8} =$ ____ $\sqrt{15} =$ ____

Since ____ is greater than ____,

$3\frac{7}{8} =$ ____ $\sqrt{15}$.

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WRITE IT

Explain why you can determine that $-\sqrt{2}$ is less than 1.2 without computation.

6 **$3.\overline{2}$ ● $\sqrt{10.4}$**

Write $\sqrt{10.4}$ as a decimal.

$\sqrt{10.4} \approx$ ____

Since $3.\overline{2}$ is ____ than 3.224903099...,

$3.\overline{2}$ ____ $\sqrt{10.4}$.

Check Your Progress **Replace each ● with <, >, or = to make a true sentence.**

a. $3\frac{3}{8}$ ● $\sqrt{14}$

____

b. $1.\overline{5}$ ● $\sqrt{2.25}$

____

EXAMPLE

7 **BASEBALL** **The time in seconds that it takes an object to fall d feet is $0.25\sqrt{d}$. How many seconds would it take for a baseball that is hit 250 feet straight up in the air to fall from its highest point to the ground?**

Use a calculator to approximate the time it will take for the baseball to fall to the ground.

$0.25\sqrt{d} = 0.25$____ Replace d with ____.

≈ 3.95 or about ____ Use a calculator.

It will take about ____ for the baseball to fall to the ground.

Check Your Progress The time in seconds that it takes an object to fall d feet is $0.25\sqrt{d}$. How many seconds would it take for a baseball that is hit 450 feet straight up in the air to fall from its highest point to the ground?

____

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3–5 The Pythagorean Theorem

MAIN IDEA

- Use the Pythagorean Theorem.

BUILD YOUR VOCABULARY (pages 62–63)

A right triangle is a triangle with one right angle of 90°.

The sides that form the right angle are called **legs.**

The **hypotenuse** is the side opposite the right angle.

The **Pythagorean Theorem** describes the relationship between the lengths of the legs and the hypotenuse for *any* right triangle.

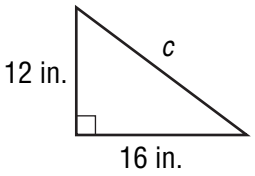
KEY CONCEPT

Pythagorean Theorem
In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.

Standard 7MG3.3 Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement. **Standard 7MR3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.**

EXAMPLES **Find the Length of a Side**

1 **Write an equation you could use to find the length of the missing side of the right triangle. Then find the missing length. Round to the nearest tenth if necessary.**



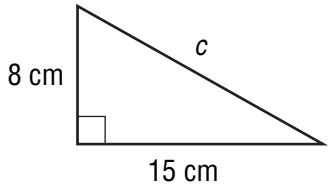
$c^2 = a^2 + b^2$	Pythagorean Theorem
$c^2 = 12^2 +$ ☐	Replace a with ☐ and b with ☐.
$c^2 =$ ☐ $+$ ☐	Evaluate 12^2 and 16^2.
$c^2 =$ ☐	Add 144 and 256.
$c = \pm\sqrt{400}$	Definition of square root
c = ☐ or ☐	Simplify.

The equation has two solutions, ☐ and ☐. However, the length of a side must be positive. So, the hypotenuse is ☐ inches long.

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Check Your Progress

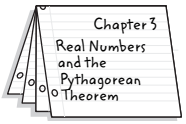
Write an equation you could use to find the length of the missing side of the right triangle. Then find the missing length. Round to the nearest tenth if necessary.



FOLDABLES™

ORGANIZE IT

On Lesson 3-5 of your Foldable, explain how to use the Pythagorean Theorem to find the missing length of a side of a right triangle.



EXAMPLE **Find the Length of a Side**

2 **The hypotenuse of a right triangle is 33 centimeters long and one of its legs is 28 centimeters. What is a, the length of the other leg?**

$c^2 = a^2 + b^2$ Pythagorean Theorem

$\square^2 = a^2 + \square^2$ Replace the variables.

$1{,}089 = a^2 + 784$ Evaluate each power.

$\square - \square = a^2 + \square - \square$ Subtract.

$\square = a^2$ Simplify.

$\pm\sqrt{305} = a$ Definition of square root

$\square = a$ Use a calculator.

The length of the other leg is about $\square$ centimeters.

REMEMBER IT

The longest side of a right triangle is the hypotenuse. Therefore, c represents the length of the longest side.

Check Your Progress The hypotenuse of a right triangle is 26 centimeters long and one of its legs is 17 centimeters. Find the length of the other leg.

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KEY CONCEPT

Converse of the Pythagorean Theorem
If the sides of a triangle have lengths a, b, and c units such that $c^2 = a^2 + b^2$, then the triangle is a right triangle.

EXAMPLE **Identify a Right Triangle**

3 **The measures of three sides of a triangle are 24 inches, 7 inches, and 25 inches. Determine whether the triangle is a right triangle.**

$c^2 = a^2 + b^2$	Pythagorean Theorem
$25^2 \stackrel{?}{=} 7^2 + 24^2$	$c = 25, a = 7, b = 24$
$625 \stackrel{?}{=} \square + 576$	Evaluate 25^2, 7^2, and 24^2.
$\square = 625$	Simplify. The triangle is a right triangle.

Check Your Progress

a. The base of a 12-foot ladder is 5 feet from the wall. How high can the ladder reach?

b. The measures of three sides of a triangle are 13 inches, 5 inches, and 12 inches. Determine whether the triangle is a right triangle.

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3–6 Using the Pythagorean Theorem

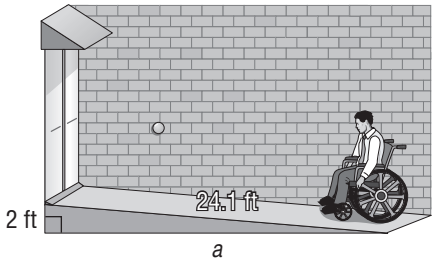
Main Idea

- Solve problems using the Pythagorean Theorem.

Standard 7MG3.3 Know and understand the Pythagorean theorem and its converse **and use it to find the length of the missing side of a right triangle and the lengths of other line segments** and, in some situations, empirically verify the Pythagorean theorem by direct measurement.

EXAMPLE Use the Pythagorean Theorem

1 RAMPS A ramp to a newly constructed building must be built according to the guidelines stated in the Americans with Disabilities Act. If the ramp is 24.1 feet long and the top of the ramp is 2 feet off the ground, how far is the bottom of the ramp from the base of the building?



Notice the problem involves a right triangle. Use the Pythagorean Theorem.

$24.1^2 = a^2 + 2^2$ Replace c with 24.1 and b with 2.

$\square = a^2 + \square$ Evaluate 24.1^2 and 2^2.

$\square - \square = a^2 = \square - \square$ Subtract $\square$ from each side.

$\square = a^2$ Simplify.

$\square = a$ Definition of square root

$\square \approx a$ Simplify.

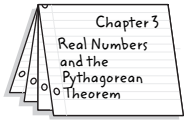
The end of the ramp is about $\square$ from the base of the building.

Check Your Progress If a truck ramp is 32 feet long and the top of the ramp is 10 feet off the ground, how far is the end of the ramp from the truck?

FOLDABLES™

ORGANIZE IT

On Lesson 3-6 of your Foldable, explain the Pythagorean Theorem in your own words and give an example of how it might be used in a real-life situation.



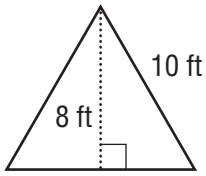
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BUILD YOUR VOCABULARY (pages 62–63)

Whole numbers such as 3, 4, and 5, which satisfy the _____, are called Pythagorean triples.

EXAMPLE

2 STANDARDS EXAMPLE **The cross-section of a camping tent is shown. Find the width of the base of the tent.**



A 6 ft
B 8 ft
C 10 ft
D 12 ft

Read the Test Item

From the diagram, you know that the tent forms two congruent right triangles. Let $a = \frac{1}{2}x$ represent half the base of the tent.

Solve the Test Item

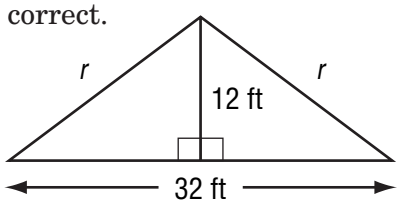
Use the Pythagorean Theorem.

$c^2 = a^2 + b^2$	Pythagorean Theorem
$\square = a^2 + \square$	$c = \square$, $b = \square$
$\square = a^2 + \square$	Evaluate 10^2 and 8^2.
$100 - 64 = a^2 + 64 - 64$	Subtract 64 from each side.
$\square = a^2$	Simplify.
$\sqrt{\square} = a$	Definition of square root
$\square = a$	Simplify

The width of the base of the tent is $a + a$ or $\square + \square = \square$ feet. Therefore, choice $\square$ is correct.

Check Your Progress

The diagram shows the cross-section of a roof. How long is each rafter, r?



F 15 ft
G 18 ft
H 20 ft
J 22 ft

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3–7 Geometry: Distance on the Coordinate Plane

Standard 7MG3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.

Main Idea

- Find the distance between points on the coordinate plane.

Build Your Vocabulary (pages 62–63)

A **coordinate plane** is formed by two number lines that form right angles and intersect at their _____ points.

The point of intersection of the two number lines is the **origin.**

The _____ number line is the ***y*-axis.**

The _____ number line is the ***x*-axis.**

The number lines separate the coordinate plane into _____ sections called **quadrants.**

Any point on the coordinate plane can be graphed by using an **ordered pair** of numbers.

The _____ number in the ordered pair is called the ***x*-coordinate.**

The _____ number of an ordered pair is the ***y*-coordinate.**

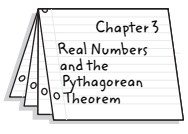
Another name for the _____ is **abscissa.**

Another name for the _____ is **ordinate.**

Foldables

Organize It

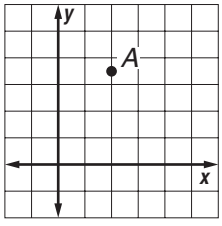
On Lesson 3-7 of your Foldable, explain in writing how to use ordered pairs to find the distance between two points.



Example 1 Name an Ordered Pair

Name the ordered pair for point *A*.

- Start at the origin.
- Move right to find the _____ of point *A*, which is _____.



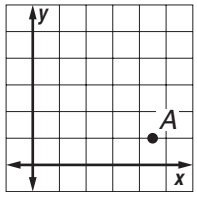
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• Move up to find the _____, which is _____.

So, the ordered pair for point A is _____.

Check Your Progress Name the ordered pair for point A.



_____

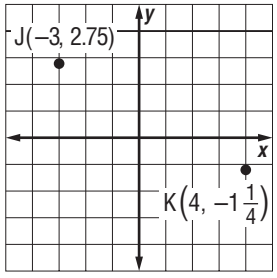
EXAMPLES **Graphing Ordered Pairs**

Graph and label each point on the same coordinate plane.

2 $J(-3, 2.75)$

• Start at _____ and move _____ units to the _____.

Then move _____ _____ units.



• Draw a dot and label it _____.

3 $K\left(4, -1\frac{1}{4}\right)$

• Start at _____ and move _____ units to the _____.

Then move _____ units.

• Draw a dot and label it _____.

Check Your Progress

Graph and label each point on the same coordinate plane.

a. $J(-2.5, 3.5)$

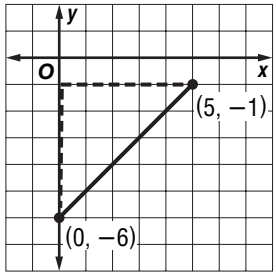
b. $K\left(2, -2\frac{1}{2}\right)$

_____

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EXAMPLE **Find the Distance on the Coordinate Plane**

4 **Graph the ordered pairs (0, −6) and (5, −1). Then find the distance between the points.**



Let c = distance between the two points, $a = 5$, and $b = 5$.

$c^2 = a^2 + b^2$ Pythagorean Theorem

$c^2 =$ ☐ $+$ ☐ Replace a with ☐ and b with ☐.

$c^2 =$ ☐ ☐ $+$ ☐ $=$ ☐

$\sqrt{c^2} =$ ☐ Definition of ☐

$c =$ ☐ Simplify.

The points are about ☐ apart.

Check Your Progress Graph the ordered pairs $(0, -3)$ and $(2, -6)$. Then find the distance between the points.

REMEMBER IT

You can use the Pythagorean Theorem to find the distance between two points on a coordinate plane.

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CHAPTER 3

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 3 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 3, go to glencoe.com	You can use your completed **Vocabulary Builder** *(pages 62–63)* to help you solve the puzzle.

3-1 Square Roots

Complete each sentence.

1. The principle square root is the _____ square root of a number.
2. To solve an equation in which one side of the square is a squared term, you can take the _____ of each side of the equation.

Find each square root.

3. $\sqrt{900}$ _____
4. $-\sqrt{\frac{36}{49}}$ _____
5. $-\sqrt{625}$ _____
6. $\sqrt{\frac{25}{121}}$ _____

3-2 Estimating Square Roots

Determine between which two consecutive whole numbers each value is located.

7. $\sqrt{23}$ _____
8. $\sqrt{59}$ _____
9. $\sqrt{27}$ _____
10. $\sqrt{18}$ _____

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3-3

Problem-Solving Investigation: Use a Venn Diagram

11. **NUMBER THEORY** A subset is a part of a set. The symbol $\subset$ means "is a subset of." Consider the following two statements.

integers $\subset$ rational numbers
rational numbers $\subset$ integers

Are both statements true? Draw a Venn diagram to justify your answer.

3-4

The Real Number System

Match the property of real numbers with the algebraic example.

12. Commutative

13. Associative

14. Distributive

15. Identity

16. Multiplicative Inverse

a. $(x + y) + z = x + (y + z)$

b. $pq = qp$

c. $h + 0 = h$

d. $c + (-c) = 0$

e. $x(y + z) = xy + xz$

f. $\frac{a}{b} \cdot \frac{b}{a} = 1$

3-5

The Pythagorean Theorem

Use the Pythagorean Theorem to determine whether each of the following measures of the sides of a triangle are the sides of a right triangle.

17. 4, 5, 6

18. 9, 12, 15

19. 10, 24, 26

20. 5, 7, 9

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3-6

Using the Pythagorean Theorem

21. The triple 8-15-17 is a Pythagorean Triple. Complete the table to find more Pythagorean triples.

	a	b	c	Check: $c^2 = a^2 + b^2$
original	8	15	17	$289 = 64 + 225$
$\times 2$				
$\times 3$				
$\times 5$				
$\times 10$				

Determine whether each of the following is a Pythagorean triple.

22. 13–84–85 ____ **23.** 11–60–61 ____

24. 21–23–29 ____ **25.** 12–25–37 ____

3-7

Geometry: Distance on the Coordinate Plane

Match each term of the coordinate plane with its description.

26. ordinate ____

27. y-axis ____

28. origin ____

29. abscissa ____

30. x-axis ____

a. one of four sections of the coordinate plane

b. x-coordinate

c. y-coordinate

d. vertical number line

e. horizontal number line

f. point where number lines meet

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CHAPTER 3 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 3.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 3 Practice Test on page 183 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 3 Study Guide and Review on pages 179–182 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 3 Practice Test on page 183 of your textbook.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 3 Foldable.
- Then complete the Chapter 3 Study Guide and Review on pages 179–182 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 3 Practice Test on page 183 of your textbook.

Student Signature

Parent/Guardian Signature

Teacher Signature

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CHAPTER 4

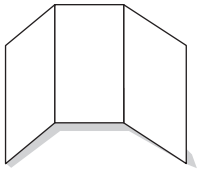
Proportions and Similarity

FOLDABLES™

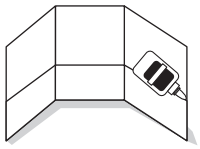
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain sheet of 11" by 17" paper.

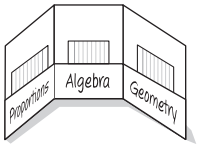
STEP 1 **Fold** in thirds widthwise.



STEP 2 **Open** and fold the bottom to form a pocket. Glue edges.



STEP 3 **Label** each pocket. Place index cards in each pocket.



NOTE-TAKING TIP: When you take notes, define new vocabulary words, describe new ideas, and write examples that help you remember the meanings of the words and ideas.

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CHAPTER 4

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 4. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
congruent			
constant of proportionality			
corresponding parts			
cross products			
equivalent ratios			
nonproportional			
polygon			
proportion			

(continued on the next page)

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Vocabulary Term	Found on Page	Definition	Description or Example
proportional			
rate			
rate of change			
ratio			
scale			
scale drawing			
scale factor			
scale model			
similar			
unit rate			
unit ratio			

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4–1 Ratios and Rates

MAIN IDEA

- Express ratios as fractions in simplest form and determine unit rates.

Standard 7AF4.2 Solve multistep problems involving rate, average speed, distance, and time or a direct variation. **Standard 7MG1.3 Use measures expressed as rates (e.g. speed, density)** and measures expressed as products (e.g. person-days) **to solve problems; check the units of the solutions;** and use dimensional analysis to check the reasonableness of the answer.

BUILD YOUR VOCABULARY (pages 85–86)

A **ratio** is a comparison of two numbers by _____.

A **rate** is a special kind of _____. It is a comparison of two quantities with different types of units.

When a rate is _____ so it has a denominator of _____, it is called a **unit rate.**

EXAMPLE 1 Write Ratios in Simplest Form

Express *12 blue marbles out of 18 marbles* in simplest form.

$\frac{12 \text{ marbles}}{18 \text{ marbles}} = \frac{\square}{\square}$

Divide the numerator and denominator by the greatest common factor, _____.

Divide out common units.

The ratio of blue marbles to marbles is _____ or _____ out of _____.

EXAMPLE 2 Find a Unit Rate

READING Yi-Mei reads 141 pages in 3 hours. How many pages does she read per hour?

Write the rate that expresses the comparison of pages to hours. Then find the unit rate.

$\frac{141 \text{ pages}}{3 \text{ hours}} = \frac{\square \text{ pages}}{\square \text{ hour}}$

Divide the numerator and denominator by _____ to get a denominator of 1.

Yi-Mei reads an average of _____ pages per _____.

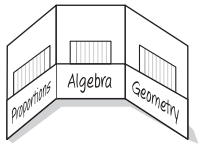
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Review It

What is the greatest common factor of two or more numbers? How can you find it? *(Prerequisite Skill)*

Foldables Organize It

Write the definitions of *rate* and *unit rate* on an index card. Then on the other side of the card, write examples of how to find and compare unit rates. Include these cards in your Foldable.



Homework Assignment

Page(s):

Exercises:

Check Your Progress **Express each ratio in simplest form.**

a. 5 blue marbles out of 20 marbles

b. 14 inches to 2 feet

c. On a trip from Columbus, Ohio, to Myrtle Beach, South Carolina, Lee drove 864 miles in 14 hours. What was Lee's average speed in miles per hour?

EXAMPLE **Compare Unit Rates**

3 **SHOPPING** **Alex spends $12.50 for 2 pounds of almonds and $23.85 for 5 pounds of jellybeans. Which item costs less per pound? By how much?**

For each item, write a rate that compares the cost to the amount. Then find the unit rates.

Almonds: $\frac{\$12.50}{2 \text{ pounds}} = \frac{\quad}{1 \text{ pound}}$

Jellybeans: $\frac{\$23.85}{5 \text{ pounds}} = \frac{\quad}{1 \text{ pound}}$

The almonds cost _____ per pound and the jellybeans cost _____ per pound. So, the jellybeans cost _____ – _____ or _____ per pound less than the almonds.

Check Your Progress Cameron spends $22.50 for 2 pounds of macadamia nuts and $31.05 for 3 pounds of cashews. Which item costs less per pound? By how much?

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4–2 Proportional and Nonproportional Relationships

Preparation for 7AF3.4 Key Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

MAIN IDEA

- Identify proportional and nonproportional relationships.

KEY CONCEPTS

Proportional A statement of equality of two ratios with a constant ratio.

Nonproportional A relationship in which two quantities do not have a common ratio.

BUILD YOUR VOCABULARY (pages 85–86)

If two quantities are _____, then they have a _____ ratio.

For ratios in which this ratio is _____, the two quantities are said to be _____.

EXAMPLES Identify Proportional Relationships

1 HOUSE CLEANING **A house-cleaning service charges $45 for the first hour and $30 per hour for each additional hour. The service works for 4 hours. Is the fee proportional to the number of hours worked? Make a table of values to explain your reasoning.**

Find the cost for 1, 2, 3, and 4 pizzas and make a table to display numbers and cost.

Hours Worked	1	2	3	4
Cost ($)				

For each number of hours, write the relationship of the cost and number of hours as a ratio in simplest form.

$\frac{\text{cost}}{\text{hours worked}} \rightarrow \frac{45}{1}$ or _____ $\frac{75}{2}$ or _____ $\frac{105}{3}$ or _____ $\frac{135}{4}$ or _____

Since the ratios of the two quantities are _____, the cost is _____ to the number of hours worked. The relationship is _____.

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2 BAKING **A recipe for jelly frosting calls for $\frac{1}{3}$ cup of jelly and 1 egg white. Is the number of egg whites used proportional to the cups of jelly used? Make a table of values to explain your reasoning.**

Find the amount of jelly and egg whites needed for different numbers of servings and make a table to show these measures.

Cups of Jelly				
Egg whites	1	2	3	4

For each number of cups of jelly, write the relationship of the _____ to the _____ as a ratio in simplest form.

_____ → $\frac{1}{3}$ / $\frac{1}{1}$ or _____ $\frac{2}{3}$ / $\frac{2}{2}$ or _____ _____ $1\frac{1}{3}$ / $\frac{4}{4}$ or _____

Since the ratios between the two quantities are all equal to _____, the amount of jelly used is _____ to the number of egg whites used.

Check Your Progress

a. PLUMBING A plumbing company charges $50 for the first hour and $40 for each additional hour. Suppose a service call is estimated to last 4 hours. Is the fee proportional to the number of hours worked?

b. COOKING Among other ingredients, a chocolate chip cookie recipe calls for 2.5 cups of flour for every 1 cup of sugar and every 2 eggs. Is the amount of flour used proportional to the number of eggs used?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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4–3 Solving Proportions

Standard 7AF4.2 Solve multistep problems involving rate, average speed, distance, and time or **a direct variation.**

Main Idea

- Use proportions to solve problems.

Build Your Vocabulary (pages 85–86)

In a **proportion,** two ____ are ____.

In a proportion, the **cross products** are ____.

Key Concepts

Proportion A proportion is an equation stating that two ratios are equivalent.

Property of Proportions The cross products of a proportion are equal.

FOLDABLES Be sure to include this definition and property in your Foldable.

EXAMPLE **Write and Solve a Proportion.**

1 **COOKING** **A recipe serves 10 people and calls for 3 cups of flour. If you want to make the recipe for 15 people, how many cups of flour should you use?**

cups of flour → $\frac{3}{10} = \frac{n}{15}$ ← cups of flour
total people served → total people served

$\frac{\square}{\square} = \frac{\square}{\square}$ Find the cross products.

$45 = 10n$ Multiply.

$\frac{45}{\square} = \frac{10n}{\square}$ Divide each side by ____.

$\square = n$ Simplify.

You will need ____ cups of flour to make the recipe for 15 people.

Check Your Progress **COOKING** A recipe serves 12 people and calls for 5 cups of sugar. If you want to make the recipe for 18 people, how many cups of sugar should you use?

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EXAMPLE

2 **FOOD** **Haley bought 4 pounds of tomatoes for $11.96. Write an equation relating the cost to the number of pounds of tomatoes. How much would Haley pay for 6 pounds at this same rate? for 10 pounds?**

Find the constant of proportionality between cost and pounds.

$\frac{\text{cost in dollars}}{\text{pounds of tomatoes}} = \frac{11.96}{4}$ or 2.99 The cost is $2.99 per pound.

Words ▼ **Variables** ▼ **Equation**

The cost is $2.99 times the number of pounds.

Let c represent the cost.
Let p represent the number of pounds.

$c = 2.99 \cdot p$

Use this same equation to find the cost for 6 and 10 pounds of tomatoes sold at the same rate.

$c = 2.99p$ ← Write the equation. → $c = 2.99p$

$c = 2.99$ ☐ ← Replace p with the number of pounds. → $c = 2.99$ ☐

$c =$ ☐ ← Multiply. → $c =$ ☐

The cost for 6 pounds of tomatoes is ☐ and for 10 pounds is ☐.

Check Your Progress **FOOD** Cameron bought 3 pounds of apples for $11.37. Write an equation relating the cost to the number of pounds of apples. How much would Cameron pay for 5 pounds at this same rate?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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4–4 Problem-Solving Investigation: Draw a Diagram

EXAMPLE

MAIN IDEA

- Solve problems by drawing a diagram.

Standard 7MR2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, **diagrams,** and models, to explain mathematical reasoning.

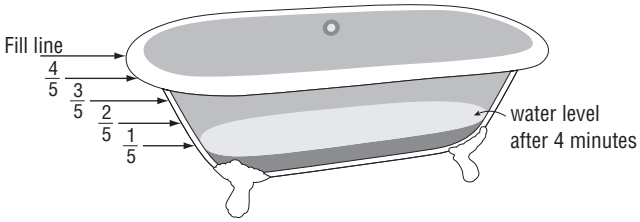
Standard 7AF4.2 Solve multistep problems involving rate, average speed, distance, and time or a direct variation.

VOLUME **A bathtub is being filled with water. After 4 minutes, $\frac{1}{5}$ of the bathtub is filled. How much longer will it take to completely fill the bathtub assuming the water rate is constant?**

EXPLORE After 4 minutes, the bathtub is $\frac{1}{5}$ of the way filled. How many more minutes will it take to fill the bathtub?

PLAN Draw a diagram showing the water level after every 4 minutes.

SOLVE The bathtub will be filled after _____ 4-minute periods. This is a total of 5×4 or _____.



CHECK The question asks how much *longer* will it take to completely fill the bathtub after the initial 4 minutes. Since the total time needed is 20 minutes, it will take _____ or _____ to completely fill the bathtub.

Check Your Progress **VOLUME** A swimming pool is being filled with water. After 3 hours, $\frac{1}{4}$ of the pool is filled. How much longer will it take to completely fill the swimming pool assuming the water rate is constant?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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4–5 Similar Polygons

Reinforcement of Standard 6NS1.3 Use proportions to solve problems. Use cross multiplication as a method for solving such problems, understanding it as the multiplication of both sides of an equation by a multiplicative inverse.

MAIN IDEA

- Identify similar polygons and find missing measures of similar polygons.

KEY CONCEPT

Similar Polygons If two polygons are similar, then

- their corresponding angles are congruent, or have the same measure, and
- their corresponding sides are proportional.

BUILD YOUR VOCABULARY (pages 85–86)

A **polygon** is a simple closed figure in a plane formed by _____ line segments.

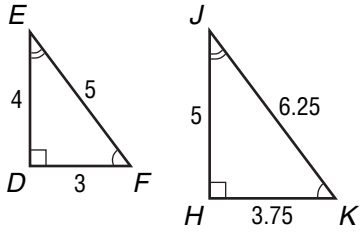
Polygons that have the _____ shape are called similar polygons.

The parts of _____ figures that "match" are called **corresponding parts.**

Congruent means to have the _____ measure.

EXAMPLE 1 Identify Similar Polygons

Determine whether triangle *DEF* is similar to triangle *HJK*. Explain your reasoning.



First, check to see if corresponding angles are congruent.

$\angle D \cong \angle H$, $\angle E \cong \angle J$, and $\angle F \cong \angle K$.

Next, check to see if corresponding sides are proportional.

$$\frac{DE}{HJ} = \_\_\_\_ = 0.8 \qquad \frac{EF}{JK} = \_\_\_\_ = 0.8$$

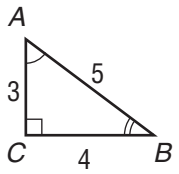
$$\frac{DF}{HK} = \_\_\_\_ = 0.8$$

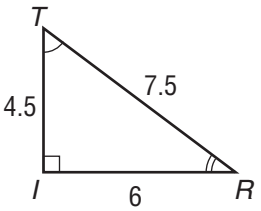
Since the corresponding angles are congruent and $\frac{4}{5} = \frac{5}{6.25} = \frac{3}{3.75}$, triangle *DEF* is _____ to triangle *HJK*.

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Check Your Progress

Determine whether triangle *ABC* is similar to triangle *TRI*. Explain your reasoning.





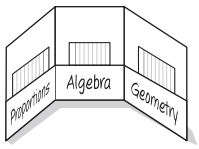
BUILD YOUR VOCABULARY (pages 85–86)

The ____ of the lengths of two ____ sides of two similar polygons is called the **scale factor.**

FOLDABLES

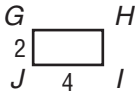
ORGANIZE IT

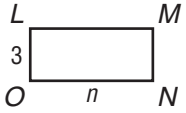
Make vocabulary cards for each term in this lesson. Be sure to place the cards in your Foldable.



EXAMPLE 2 Finding Missing Measures

Given that rectangle *LMNO* ~ rectangle *GHIJ*, find the missing measure.





METHOD 1 Write a proportion.

The missing measure n is the length of $\overline{NO}$. Write a proportion involving NO that relates corresponding sides of the two rectangles.

rectangle *GHIJ* → ____ = ____ ← rectangle *GHIJ*
rectangle *LMNO* → ____ = ____ ← rectangle *LMNO*

$\frac{2}{3} = \frac{4}{n}$ $GJ =$ ____, $LO =$ ____, $IJ =$ ____, and $NO =$ ____

____ $\cdot n =$ ____ $\cdot 4$ Find the cross products.

____ = ____ Multiply.

____ = ____ Divide each side by 2.

METHOD 2 Use the scale factor to write an equation.

Find the scale factor from rectangle *GHIJ* to rectangle *LMNO* by finding the ratio of corresponding sides with known lengths.

scale factor: $\frac{GJ}{LO} =$ ____ The scale factor is the constant of proportionality.

(continued on the next page)

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Words A length on rectangle *GHIJ* is ____ times as long as a corresponding length on rectangle ____.

Variables Let ____ represent the measure of ____.

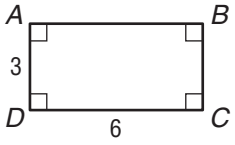
Equation ____

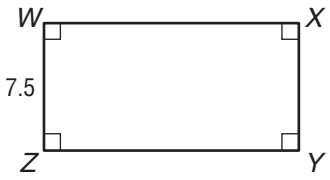
$$4 = \frac{2}{3}n$$ Write the equation.

$$4 \cdot \square = \square \cdot \frac{2}{3}n$$ Multiply each side by ____.

$$\square = \square$$ Simplify.

Check Your Progress Given that rectangle $ABCD \sim$ rectangle $WXYZ$, write a proportion to find the measure of $\overline{ZY}$. Then solve.





Homework Assignment

Page(s):

Exercises:

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4–6 Measurement: Converting Length, Weight/Mass, Capacity, and Time

Main Idea

- Convert customary and metric units of length, weight or mass, capacity, and time.

Standard 7MG1.1 **Compare weights, capacities, geometric measures, times,** and temperatures **within and between measurement systems (e.g. miles per hour and feet per second, cubic inches to cubic centimeters).**

Remember It

The prefix *kilo-* means 1,000. The prefix *centi-* means 0.01. The prefix *milli-* means 0.001.

Build Your Vocabulary (pages 85–86)

A _____ is a ratio in which the denominator is 1 unit.

Examples

1 **Convert $2\frac{1}{2}$ pounds to ounces.**

Since _____ pound = 16 ounces, the unit ratio is $\frac{\text{_____}}{1 \text{ lb}}$.

$2\frac{1}{2}$ lb = $2\frac{1}{2}$ lb · _____ — _____ by $\frac{16 \text{ oz}}{1 \text{ lb}}$.

$= 2\frac{1}{2}$ ~~lb~~ · $\frac{16 \text{ oz}}{1 \text{ ~~lb~~}}$ — Divide out common units, leaving the desired unit, _____.

$= 2\frac{1}{2} \cdot 16$ oz or _____ oz — Multiply.

$2\frac{1}{2}$ pounds is equal to _____ ounces.

2 **SHIPPING** **Cristos is shipping a package of model train parts. The sum of the weights of the parts is 900 grams. What is the weight of the parts in kilograms?**

900 g = 900 g · $\frac{1 \text{ kg}}{1{,}000 \text{ g}}$ — Since 1 kilogram = _____ grams, multiply by $\frac{1 \text{ kg}}{1{,}000 \text{ g}}$.

= _____ ~~g~~ · $\frac{1 \text{ kg}}{1{,}000 \text{ ~~g~~}}$ — Divide out common units, leaving the desired unit, _____.

= _____ kg or 0.9 kg — Multiply.

The weight of the train parts is _____ kilogram.

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3 **Convert 10 miles to kilometers. Round to the nearest hundredth.**

METHOD 1

Use 1 km ≈ 0.621 mi.

The unit ratio is $\square$.

$10 \text{ mi} \approx \square \text{ mi} \cdot \frac{1 \text{ km}}{0.621 \text{ mi}}$ Since 1km ≈ 0.621mi, multiply by $\frac{1 \text{ km}}{0.621 \text{ mi}}$. Divide out common units, leaving the desired unit, kilometer.

$\approx \frac{10 \text{ km}}{0.621}$ or $\square$ km Multiply.

METHOD 2

Use 1 mi ≈ 1.609 km.

The unit ratio is $\square$.

$10 \text{ mi} \approx \square \text{ mi} \cdot \frac{1.609 \text{ km}}{1 \text{ mi}}$ Multiply by $\frac{1.609 \text{ km}}{1 \text{ mi}}$. Divide out common units, leaving the desired unit, kilometer.

$\approx 10 \cdot 1.609$ or $\square$ km Multiply.

10 miles is equal to about $\square$ kilometers.

Check Your Progress **Convert each measurement. Round to the nearest hundredth if necessary.**

a. 7 km = ● m $\square$

b. 72 in. = ● ft $\square$

c. 12 fl oz = ● mL $\square$

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EXAMPLE

4 **HEALTH** **To replenish water lost during moderate activity, the average adult should consume 35 milliliters of fluid per kilogram of body weight. How many fluid ounces is this per pound?**

To convert ☐ milliliters per kilogram to fluid ounces per pound, use conversion factors relating milliliters to fluid ounces and kilograms to pounds.

$$\frac{\square\ \text{mL}}{\text{kg}} \cdot \frac{1\ \text{fl oz}}{29.574\ \square} \cdot \frac{0.454\ \text{kg}}{1\ \square}$$

$$= \frac{35\ \cancel{\text{mL}}}{\cancel{\text{kg}}} \cdot \frac{1\ \text{fl oz}}{29.574\ \cancel{\text{mL}}} \cdot \frac{0.454\ \cancel{\text{kg}}}{1\ \text{lb}}$$ ☐ out common units.

$$= \frac{\square\ \text{fl oz}}{29.574\ \text{lb}}$$ Multiply.

$$= \frac{\square\ \text{fl oz}}{1\ \square}$$ Divide.

The average adult should consume about ☐ fluid ounces per pound.

Check Your Progress **HORSES** A Clydesdale horse drinks about 114 liters of water per day. How many gallons is this per week?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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4–7 Measurement: Converting Square Units and Cubic Units

Main Idea

- Convert square and cubic units of length, weight or mass, capacity, and time in both customary and metric systems.

Standard 7MG1.1 Compare weights, capacities, geometric measures, times, and temperatures **within and between measurement systems (e.g. miles per hour and feet per second, cubic inches to cubic centimeters). Standard 7MG2.4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft^2] = [144 in^2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in^3] = [16.38 cm^3]).**

EXAMPLES Convert Units of Area

Complete each conversion.

1 **5.8 m^2 = ● cm^2**

$5.8\ \text{m}^2 = 5.8 \times \cancel{\text{m}} \times \cancel{\text{m}} \times \dfrac{\square\ \text{cm}}{1\ \cancel{\text{m}}} \times \dfrac{\square\ \text{cm}}{1\ \cancel{\text{m}}}$

Multiply by the unit ratio, $\dfrac{100\ \text{cm}}{1\ \text{m}}$.

$= \square\ \text{cm}^2$

2 **1,296 in.^{2} = ● ft^2**

$1{,}296\ \text{in.}^2 = 1{,}296 \times \cancel{\text{in.}} \times \cancel{\text{in.}} \times \dfrac{1\ \text{ft}}{\square\ \cancel{\text{in.}}} \times \dfrac{1\ \text{ft}}{\square\ \cancel{\text{in.}}}$

Multiply by the unit ratio, $\square$.

$= \square\ \text{ft}^2$

Check Your Progress **Complete each conversion.**

a. 3.5 yd^2 = ● ft^2

b. 12,500 cm^2 = ● m^2

EXAMPLE Convert Units of Volume

3 **AIR QUALITY** **Morgan is using an air purifier in a room that he estimates holds about 27 cubic yards of air. How many cubic feet of air will the air purifier need to clean?**

To convert from cubic yards to $\square$, use the unit ratio $\square$.

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The unit ratio is $\square$.

$$27 \text{ yd}^3 = \square \times \cancel{\text{yd}} \times \cancel{\text{yd}} \times \cancel{\text{yd}} \times \frac{3 \text{ ft}}{1 \cancel{\text{yd}}} \times \frac{3 \text{ ft}}{1 \cancel{\text{yd}}} \times \frac{3 \text{ ft}}{1 \cancel{\text{yd}}}$$

$$= \square \text{ ft}^3$$

The air purifier will need to clean $\square$ cubic feet of air.

Check Your Progress **POOLS** A swimming pool holds 2,500 cubic feet of water. How many cubic yards is this?

EXAMPLE **Convert Between Systems**

4 **Convert 90 cubic feet to cubic meters.**

The unit ratio is $\square$.

$$90 \text{ ft}^3 = 90 \times \cancel{\text{ft}} \times \cancel{\text{ft}} \times \cancel{\text{ft}} \times \frac{\square \text{ m}}{1 \cancel{\text{ft}}} \times \frac{\square \text{ m}}{1 \cancel{\text{ft}}} \times \frac{\square \text{ m}}{1 \cancel{\text{ft}}}$$

$$= \square \text{ m}^3$$

Check Your Progress Convert 64 square inches to square centimeters.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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4–8 Scale Drawings and Models

Standard 7MG1.2 Construct and read drawings and models made to scale.

MAIN IDEA

- Solve problems involving scale drawings.

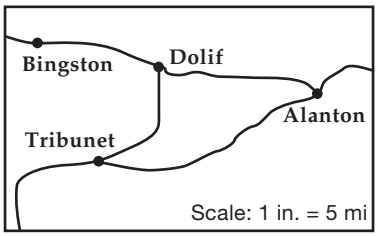
BUILD YOUR VOCABULARY (pages 85–86)

A **scale drawing** or a **scale model** is used to represent an object that is too [ ] or too [ ] to be drawn or built at actual size.

The **scale** is determined by the [ ] of given length on a [ ] to the corresponding actual length of the object.

EXAMPLE **Find a Missing Measurement**

1 **RECREATION** **Use the map to find the actual distance from Bingston to Alanton.**



Use an inch ruler to measure the map distance.

The map distance is about 1.5 inches.

METHOD 1 Write and solve a proportion.

map → $\frac{1 \text{ in.}}{5 \text{ mi}} = \frac{\square}{\square}$ ← map

actual → actual

$\square = \square$ Find the cross products.

$x = \square$ Simplify.

METHOD 2 Write and solve an equation.

Write the scale as [ ] which means [ ] per inch.

REMEMBER IT

Scales and scale factors are usually written so that the drawing length comes first in the ratio.

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Words ▼ **Variables** ▼ **Equation**

The actual distance is ____ per inch of map distance.

Let a represent the actual distance in miles.
Let m represent the map distance in inches.

____

$a =$ ____ Write the equation.

$a = 5$ ____ Replace m with ____.

$a =$ ____ Multiply.

The actual distance from Bingston to Alanton is ____.

EXAMPLE **Find the Scale**

2 SCALE DRAWINGS **A wall in a room is 15 feet long. On a scale drawing it is shown as 6 inches. What is the scale of the drawing?**

Write and solve a proportion to find the scale of the drawing.

Length of Room → scale drawing length → actual length

$$\frac{6 \text{ in.}}{15 \text{ ft}} = \frac{1 \text{ in.}}{x \text{ ft}}$$

← Scale Drawing ← scale drawing length ← actual length

____ = ____ Find the cross products. Multiply. Then divide each side by 6.

$x =$ ____ Simplify.

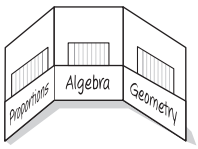
So, the scale is 1 inch = ____.

Check Your Progress The length of a garage is 24 feet. On a scale drawing the length of the garage is 10 inches. What is the scale of the drawing?

FOLDABLES™

ORGANIZE IT

Write definitions of *scale, scale drawing,* and *scale model* on cards and give your own examples. Be sure to explain how to create a scale for a scale drawing or model.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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4–9 Rates of Change

Preparation for Standard 7AF3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

MAIN IDEA
- Find rates of change.

BUILD YOUR VOCABULARY (pages 85–86)

A **rate of change** is a rate that describes how one quantity _____ in _____ to another.

EXAMPLE Find a Rate of Change

1 DOGS **The table below shows the weight of a dog in pounds between 4 and 12 months old. Find the rate of change in the dog's weight between 8 and 12 months of age.**

Age (mo)	4	8	12
Weight (lb)	15	28	43

$$\frac{\text{change in weight}}{\text{change in age}} = \frac{(43 - \square)\text{ pounds}}{(\square - 8)\text{ months}}$$

The dog grew from 28 to 43 pounds from ages 8 to 12 months.

$$= \frac{\square\text{ pounds}}{\square\text{ months}}$$

Subtract to find the change in weights and ages.

$$= \frac{\square\text{ pounds}}{\square\text{ month}}$$

Express this rate as a _____.

The dog grew an average of _____ pounds per _____.

REMEMBER IT

Rate of change is always expressed as a unit rate.

Check Your Progress The table below shows Julia's height in inches between the ages of 6 and 11. Find the rate of change in her height between ages 6 and 9.

Age (yr)	6	9	11
Weight (in.)	52	58	60

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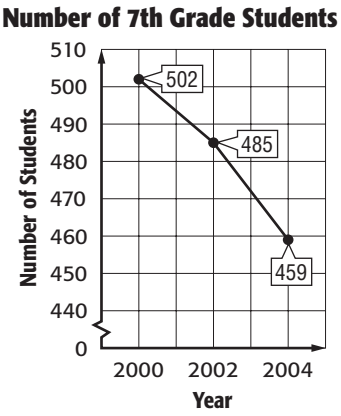
EXAMPLE Find a Negative Rate of Change

KEY CONCEPT

Rate of Change To find the rate of change, divide the difference in the *y*-coordinate by the difference in the *x*-coordinate.

FOLDABLES Record this concept on one side of an index card. Write an example on the other side of the card.

2 SCHOOLS **The graph shows the number of students in the seventh grade between 2000 and 2004. Find the rate of change between 2002 and 2004.**



Use the data to write a rate comparing the change in students to the change in time.

$$\frac{\text{change in students}}{\text{change in time}} = \frac{\square - \square}{\square - \square}$$

The number of students changed from 485 to 459 from 2002 to 2004.

$$= \frac{\square}{\square}$$

Simplify.

$$= \frac{\square}{\square}$$

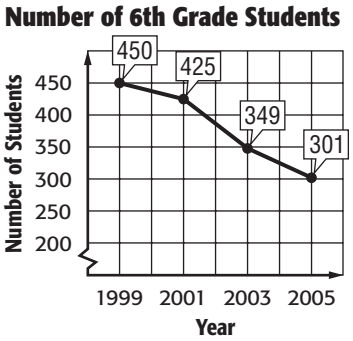
Express as a unit rate.

The rate of change is ☐ students per ☐.

REMEMBER IT

Always read graphs from left to right.

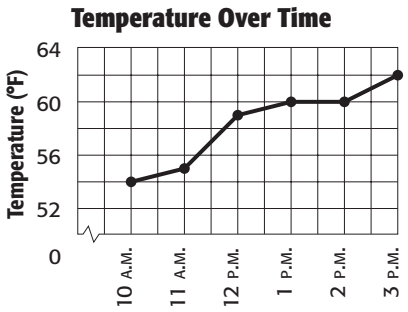
Check Your Progress The graph below shows the number of students in the 6th grade between 1999 and 2005. Find the rate of change between 2003 and 2005.



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EXAMPLES Compare Rates of Change

3 TEMPERATURE **the graph shows the temperature measured on each hour from 10 A.M. to 3 P.M. During which 1-hour period was the rate of change in temperature the greatest?**



Find the rates of change for each 1-hour period. Use the ratio $\frac{\text{change in temperature}}{\text{change in time}}$.

10 A.M. to 11 A.M. $\quad \frac{55° - 54°}{11 \text{ A.M.} - 10 \text{ A.M.}} = $ ☐

11 A.M. to 12 P.M. $\quad \frac{59° - 55°}{12 \text{ P.M.} - 11 \text{ A.M.}} = $ ☐

12 P.M. to 1 P.M. $\quad \frac{60° - 59°}{2 \text{ P.M.} - 12 \text{ P.M.}} = $ ☐

1 P.M. to 2 P.M. $\quad \frac{60° - 60°}{2 \text{ P.M.} - 1 \text{ P.M.}} = $ ☐

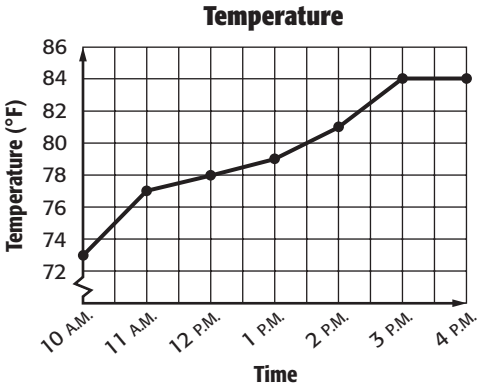
2 P.M. to 3 P.M. $\quad \frac{62° - 60°}{3 \text{ P.M.} - 2 \text{ P.M.}} = $ ☐

The greatest rate of change in temperature is ☐

between ☐

Check Your Progress

The graph shows the temperature measured each hour from 10 a.m. to 4 p.m. Find the 1-hour time period in which the rate of change in temperature was the greatest.



☐

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4–10 Constant Rate of Change

Preparation for Standard 7AF3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.

MAIN IDEA

- Identify proportional and nonproportional relationships by finding a constant rate of change.

BUILD YOUR VOCABULARY (pages 85–86)

A relationship that has a straight-line graph is called a _____. The rate of change between any two points of a _____ is _____.

EXAMPLE **Identify linear Relationships**

1 BABY-SITTING **The amount a baby-sitter charges is shown. Is the relationship between the number of hours and the amount charged linear? If so, find the constant rate of change. If not, explain your reasoning.**

Number of Hours	Amount Earned
1	$10
2	$18
3	$26
4	$34

Examine the change in the number of hours worked and in the amount earned.

	Number of Hours	Amount Earned	
	1	$10	
+1	2	$18	+8
+1	3	$26	+8
+1	4	$34	+8

Since the rate of change _____, this is _____. The _____ is $\frac{8}{1}$ or _____. This means that the babysitter earns _____.

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Check Your Progress

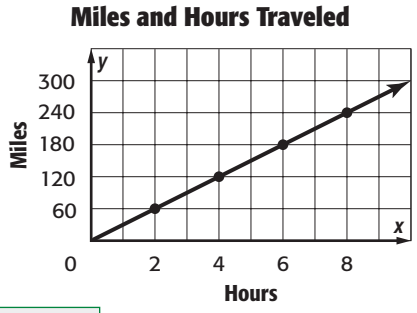
BABY-SITTING The amount a baby-sitter charges is shown. Is the relationship between the number of hours and the amount charged linear? If so, find the constant rate of change.

Number of Hours	Amount Earned
1	$10
2	$18
3	$26
4	$34

EXAMPLE Find a Constant Rate of Change

2 TRAVEL Find the constant rate of change for the hours traveled and miles traveled. Interpret its meaning.

Choose any two points on the line and find the rate of change between them.



(2, 60) →

(4, 120) →

$\frac{\text{change in miles}}{\text{change in time}} =$

The amount of miles from 60 to 120 between hours 2 and 4.

=

Subtract.

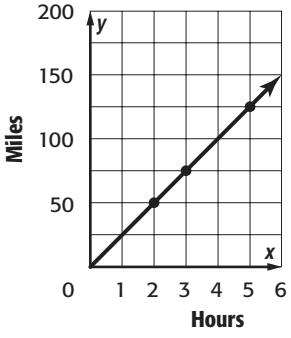
=

Express as a unit rate.

The rate of speed is .

Check Your Progress

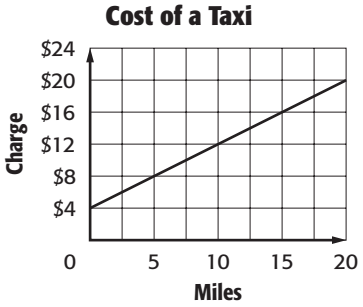
TRAVEL Find the constant rate of change for the hours traveled and miles traveled. Interpret its meaning.



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EXAMPLE

3 TAXIS **Use the graph to determine if there is a proportional linear relationship between the miles driven and the charge for a ride. Explain your reasoning.**



Since the graph of the data forms a line, the relationship between the two scales is linear. This can also be seen in the table of values created using the points on the graph.

		+4	+4	+4	+4
Charge ($)	4	8	12	16	20
Miles	0	5	10	15	20
		+5	+5	+5	+5

Constant Rate of Change

$$\frac{\text{change in charge}}{\text{change in miles}} = \square$$

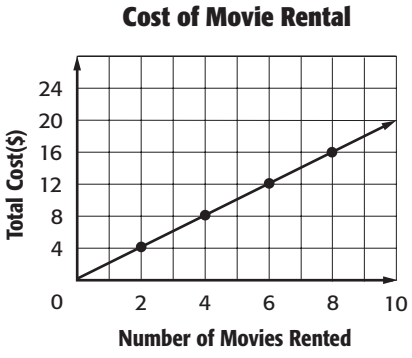
To determine if the two scales are proportional, express the relationship between the charges for several miles as a ratio.

$$\frac{\text{charge}}{\text{miles}} \rightarrow \frac{8}{5} = \square \qquad \frac{12}{10} = \square \qquad \frac{16}{15} \approx \square$$

Since the ratios are _____, the total charge is _____ to the number of miles driven.

Check Your Progress

MOVIES Use the graph to determine if there is a proportional linear relationship between the number of movies rented and the total cost. Explain your reasoning.



HOMEWORK ASSIGNMENT

Page(s):

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CHAPTER 4

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 4 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 4, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 85–86)* to help you solve the puzzle.

4-1 Ratios and Rates

Match each phrase with the term they describe.

1. a comparison of two numbers ____
2. a comparison of two quantities with different types of units ____
3. a rate that is simplified so it has a denominator of 1 ____

a. unit rate
b. numerator
c. ratio
d. rate

4. Express 12 wins to 14 losses in simplest form. ____

5. Express 6 inches of rain in 4 hours as a unit rate. ____

4-2 Proportional and Nonproportional Relationships

Determine whether each relationship is proportional.

6.

Side length (ft)	1	2	3	4	5
Perimeter (ft)	4	8	12	16	20

____

7.

Time (hr)	1	2	3	4	5
Rental Fee ($)	10.00	12.50	15.00	17.50	20.00

____

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4-3

Solving Proportions

8. Do the ratios $\frac{a}{b}$ and $\frac{c}{d}$ always form a proportion? Why or why not?

Solve each proportion.

9. $\frac{7}{b} = \frac{35}{5}$

10. $\frac{a}{16} = \frac{3}{8}$

11. $\frac{4}{13} = \frac{3}{c}$

4-4

Problem-Solving Investigation: Draw a Diagram

12. **FAMILY** At Willow's family reunion, $\frac{4}{5}$ of the people are 18 years of age or older. Half of the remaining people are under 12 years old. If 20 children are under 12 years old, how many people are at the reunion?

4-5

Similar Polygons

13. If two polygons have corresponding angles that are congruent, does that mean that the polygons are similar? Why or why not?

14. Rectangle *ABCD* has side lengths of 30 and 5. Rectangle *EFGH* has side lengths of 15 and 3. Determine whether the rectangles are similar.

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4-6

Measurement: Converting Length, Weight/Mass, Capacity, and Time

15. ANIMALS A blue whale calf measures about 23 feet in length. How many yards is this?

Complete each conversion. Round to the nearest hundredth if necessary.

16. 6 qt ≈ ● L

17. 20 cm ≈ ● in.

18. 100 gal/h ≈ ● L/min

19. 5 km/min ≈ ● mi/h

4-7

Measurement: Converting Square Units and Cubic Units

Complete each conversion. Round to the nearest hundredth if necessary.

20. 4 ft^2 ≈ ● $in.^2$

21. 150 ft^3 ≈ ● yd^3

22. 320 cm^2 ≈ ● $in.^2$

23. 3 mi^3 ≈ ● km^3

4-8

Scale Drawings and Models

24. The scale on a map is 1 inch = 20 miles. Find the actual distance for the map distance of $\frac{5}{8}$ inch.

25. What is the scale factor for a model if part of the model that is 4 inches corresponds to a real-life object that is 16 inches?

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4-9

Rate of Change

Use the table shown to answer each question.

26. Find the rate of change in the number of bicycles sold between weeks 2 and 4.

Week	Bicycles Sold
2	2
4	14
6	14
8	12

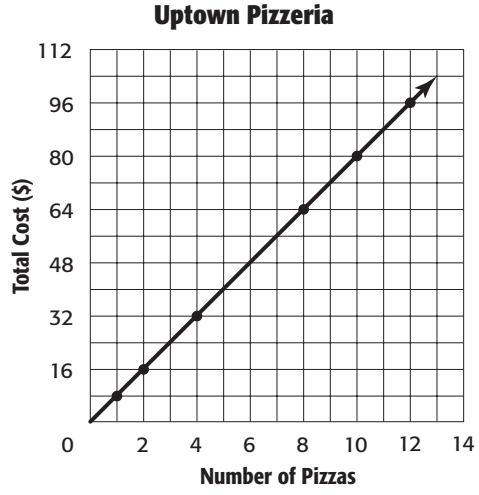
27. Between which weeks is the rate of change negative?

4-10

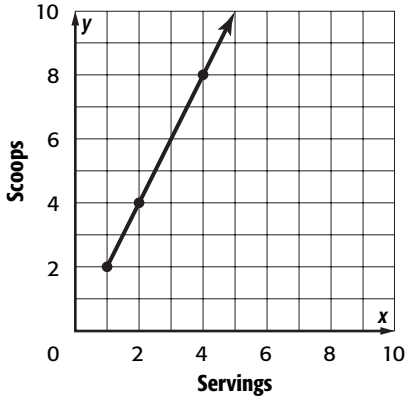
Constant Rate of Change

Find the constant rate of change for each graph and interpret its meaning.

28.



29.



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CHAPTER 4 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 4.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 4 Practice Test on page 247 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 4 Study Guide and Review on pages 242–246 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 4 Practice Test on page 247.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 4 Foldable.
- Then complete the Chapter 4 Study Guide and Review on pages 242–246 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 4 Practice Test on page 247.

Student Signature

Parent/Guardian Signature

Teacher Signature

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CHAPTER 5

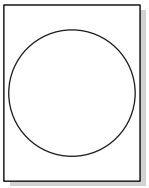
Percent

FOLDABLES™

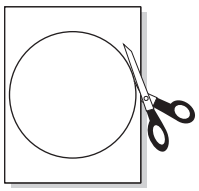
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with 4 sheets of $8\frac{1}{2}$" × 11" paper.

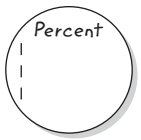
STEP 1 **Draw** a large circle on one of the sheets of paper.



STEP 2 **Stack** the sheets of paper. Place the one with the circle on top. Cut all four sheets in the shape of a circle.



STEP 3 **Staple** the circles on the left side. Write the chapter title and the first four lesson numbers on each circle.



STEP 4 **Turn** the circles to the back side so that the staples are still on the left. Write the last four lesson titles on the front and right pages of the journal.



NOTE-TAKING TIP: When you take notes, it may help to create a visual representation, such as a drawing or a chart, to organize the information you learn. When you use a visual, be sure to clearly label it.

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CHAPTER 5

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 5. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
compatible numbers			
discount			
interest			
markup			
percent			

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Vocabulary Term	Found on Page	Definition	Description or Example
percent equation			
percent of change			
percent of decrease			
percent of increase			
percent proportion			
principal			
selling price			

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5–1 Ratios and Percents

Standard 7NS1.3 Convert fractions to decimals and **percents** and use these representations in estimations, computations, and applications.

MAIN IDEA
- Write ratios as percents and vice versa.

BUILD YOUR VOCABULARY (pages 116–117)

_____ such as 27 out of 100 or 8 out of 25 can be written as **percents.**

KEY CONCEPT

Percent A percent is a ratio that compares a number to 100.

EXAMPLES **Write Ratios as Percents**

1 POPULATION **According to a recent census, 13 out of every 100 people living in Delaware were 65 or older. Write this ratio as a percent.**

13 out of every _____ = 13%

2 BASEBALL **Through 2005, Manny Ramirez has gotten on base 40.9 times for every 100 times at bat. Write this ratio as a percent.**

40.9 out of _____ = 40.9%

Check Your Progress **Write each ratio as a percent.**

a. 59 out of 100

b. 68 out of 100

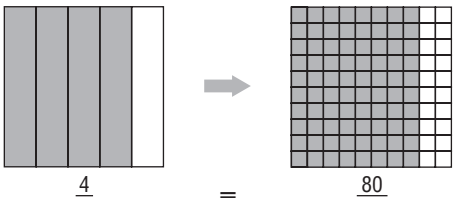
EXAMPLES **Write Ratios and Fractions as Percents**

3 TRANSPORTATION **About 4 out of 5 commuters in the United States drive or carpool to work. Write this ratio as a percent.**

$\times$ _____

$\frac{4}{5} = \frac{80}{100}$

$\times$ _____



$\frac{4}{5}$ = $\frac{80}{100}$

So, _____ out of _____ equals _____.

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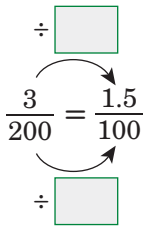
FOLDABLES™

ORGANIZE IT

Write in words and symbols what you've learned about expressing ratios as percents.



4 **INTERNET** **In 2000, about $\frac{3}{200}$ of the population in Peru used the Internet. Write this fraction as a percent.**



So, ☐ out of ☐ equals ☐.

Check Your Progress **Write each ratio or fraction as a percent.**

a. 3 out of 5

b. $\frac{122}{200}$ teens

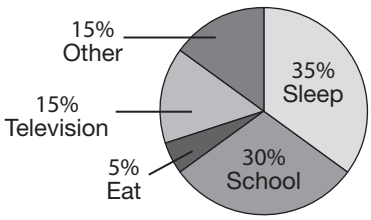
EXAMPLE **Write Percents as Fractions**

5 **SCHEDULE** **The circle graph shows an estimate of the percent of his day that Peter spends on each activity. Write the percents for eating and sleeping as fractions in simplest form.**

Eating: 5% = ☐ or ☐

Sleeping: 35% = ☐ or ☐

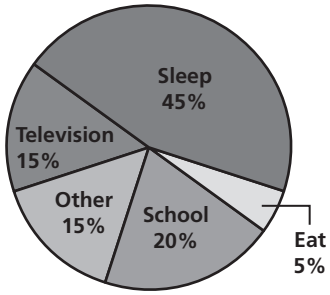
How Peter Spends His Day



Check Your Progress

The circle graph shows an estimate of the percent of his day that Leon spends on each activity. Write the percents for school and television as fractions in simplest form.

How Leon Spends His Day



HOMEWORK ASSIGNMENT

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5–2 Comparing Fractions, Decimals, and Percents



Standard 7NS1.1 Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10), **compare rational numbers in general. Standard 7NS1.3 Convert fractions to decimals and percents** and use these representations in estimations, computations, and **applications.**

MAIN IDEA

- Write percents as fractions and decimals and vice versa.

KEY CONCEPTS

Decimals and Percents
To write a percent as a decimal, divide by 100 and remove the percent symbol.

To write a decimal as a percent, multiply by 100 and add the percent symbol.

EXAMPLES Percents as Decimals

Write each percent as a decimal.

1 **52%**

$52\% = \underbrace{52}\%$ Divide by ☐.

$= \square$ Remove the percent symbol.

2 **245%**

$245\% = \underbrace{245}\%$ Divide by ☐.

$= \square$ Remove the percent symbol.

Check Your Progress **Write each percent as a decimal.**

a. 28%

☐

b. 135%

☐

EXAMPLES Decimals as Percents

Write each decimal as a percent.

3 **0.3**

$0.3 = 0.\underbrace{30}$ Multiply by ☐.

$= \square$ Add the percent symbol.

4 **0.71**

$0.71 = 0.\underbrace{71}$ Multiply by ☐.

$= \square$ Add the percent symbol.

Check Your Progress **Write each decimal as a percent.**

a. 0.91

☐

b. 1.65

☐

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EXAMPLES Fractions as Percents

5 **Write $\frac{3}{4}$ as a percent.**

METHOD 1

Use a proportion.

$$\frac{3}{4} = \frac{x}{100}$$

$3 \cdot 100 =$ ☐

$300 =$ ☐

☐ $=$ ☐

☐ $= x$

So, $\frac{3}{4}$ can be written as ☐.

METHOD 2

First write as a decimal. Then write as a percent.

$\frac{3}{4} = 0.\underset{\smile}{75}$

$=$ ☐

$$4\overline{)3.00}\quad 0.75,\ 28,\ 20,\ 20,\ 0$$

6 **Write $\frac{1}{6}$ as a percent.**

METHOD 1

Use a proportion.

$$\frac{1}{6} = \frac{x}{100}$$

☐ $= 6 \cdot x$

☐ $= 6x$

☐ $=$ ☐

☐ $= x$

So, $\frac{1}{6}$ can be written as ☐.

METHOD 2

First write as a decimal. Then write as a percent.

$\frac{1}{6} = 0.1\overset{\frown}{6}$

$=$ ☐

$$6\overline{)1.0000}\quad 0.166\ldots,\ 6,\ 40,\ 36,\ 40,\ 36,\ 4$$

REVIEW IT

Show an example of how to write fractions as decimals. *(Lesson 2-1)*

Check Your Progress **Write each fraction as a percent.**

a. $\frac{1}{4}$

☐

b. $\frac{1}{9}$

☐

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FOLDABLES

ORGANIZE IT

Write in words and symbols what you have learned about the relationship between percents, decimals, and fractions.



EXAMPLE **Compare Numbers**

7 **POLITICS** **In Sun City, 0.45 of voters are Democrats. In Moon Town, 48% of voters are Democrats. In which town is there a greater portion of Democrats?**

Write 0.45 as a percent.

0.45 = ☐ ☐ and add the ☐ symbol.

Since ☐ is less than ☐, there are ☐ Democrats in Moon Town.

Check Your Progress In Star City, $\frac{3}{20}$ of voters are Republicans. In Meteorville, 13% of voters are Republicans. In which town is there a greater proportion of Republicans?

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5–3 Algebra: The Percent Proportion

Standard 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in** estimations, **computations, and applications.**

MAIN IDEA

- Solving problems using the percent proportion.

KEY CONCEPT

Percent Proportion

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$$

BUILD YOUR VOCABULARY (pages 116–117)

In a **percent proportion,** _____ of the numbers, called the **part,** is being compared to the _____ quantity, also called the *base*. The other ratio is the percent, written as a fraction, whose base is _____.

EXAMPLE **Find the Percent**

1 **34 is what percent of 136?**

Since 34 is being compared to 136, _____ is part and _____ is the whole. You need to find the percent. Let n represent the percent.

part → $\frac{34}{136} = \frac{n}{100}$ ← whole — Write the percent proportion.

_____ • _____ = _____ • n — Find the cross products.

_____ = _____ — Multiply.

_____ = _____ — Divide each side by _____.

_____ = _____ — Simplify.

So, 34 is _____ of 136.

Check Your Progress 63 is what percent of 210?

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FOLDABLES

ORGANIZE IT

Be sure to explain how to find the percent, the part, and the base of a percent proportion. You also may want to show the ideas in a chart like the Concept Summary in your text.



EXAMPLE **Find the Part**

2 **What number is 70% of 600?**

The percent is 70, and the whole is 600. You need to find the part. Let n represent the part.

part → $\frac{n}{600} = \frac{70}{100}$ ← part
whole → ← whole — Write the percent proportion.

$n \cdot 100 = 600 \cdot 70$ — Find the cross products.

$100n =$ ☐ — Multiply.

$\frac{100n}{100} = \frac{42{,}000}{100}$ — Divide each side by ☐.

$n =$ ☐ — Simplify.

So, ☐ is 70% of 600.

Check Your Progress What number is 40% of 400?

☐

EXAMPLE **Find the Base**

3 **BASEBALL** **From 1999 to 2001, Derek Jeter had 11 hits with the bases loaded. This was about 30% of his at bats with the bases loaded. How many times was he at bat with the bases loaded?**

The percent is 30, and the part is 11 hits. You need to find the whole number of hits.

part → $\frac{11}{n} = \frac{30}{100}$ ← percent
whole →
Write the percent proportion.

$11 \cdot$ ☐ $= n \cdot$ ☐ — Find the cross products.

☐ $=$ ☐ — Multiply.

☐ $\approx n$ — Divide each side by 30.

He had about ☐ at bats with the bases loaded.

Check Your Progress **BASEBALL** In 2005, Alex Rodriguez had 194 hits. This was about 32% of his at bats. How many times was he at bat?

☐

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5–4 Finding Percents Mentally

Standard 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in** estimations, **computations, and applications.**

MAIN IDEA

- Compute mentally with percents.

EXAMPLES Use Fractions to Compute Mentally

Compute mentally.

1 **40% of 80**

40% of 80 = ☐ of 80 or ☐

Use the fraction form of 40%, which is ☐.

2 **$66\frac{2}{3}$% of 75**

$66\frac{2}{3}$% of 75 = ☐ of 75 or ☐.

Use the fraction form of $66\frac{2}{3}$%, which is ☐.

EXAMPLES Use Decimals to Compute Mentally

Compute mentally.

3 **10% of 65**

10% of 65 = ☐ of 65 or ☐

4 **1% of 304**

1% of 304 = ☐ of 304 or ☐

Check Your Progress **Compute mentally.**

a. 20% of 60

☐

b. $66\frac{2}{3}$% of 300

☐

c. 10% of 13

☐

d. 1% of 244

☐

WRITE IT

Explain how you can move the decimal point to mentally multiply 0.1 by 1.1.

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FOLDABLES

ORGANIZE IT

In your Foldable, be sure to include examples that show how to estimate percents of numbers.



EXAMPLE **Use Mental Math to Solve a Problem**

5 **TECHNOLOGY** **A company produces 2,500 of a particular printer. They later discover that 25% of the printers have defects. How many printers from this group have defects?**

METHOD 1 Use a fraction.

25% of 2,500 = ☐ of 2,500

THINK $\frac{1}{4}$ of 2,000 is ☐ and $\frac{1}{4}$ of 500 is ☐.

So, ☐ of 2,500 is ☐ + ☐ or ☐.

METHOD 2 Use a decimal.

25% of 2,500 = ☐ of 2,500

THINK 0.5 of 2,500 is ☐.

So, 0.25 of 2,500 is ☐ • ☐ or ☐.

There were ☐ printers that had defects.

Check Your Progress A company produces 1,400 of a particular monitor. They later discover that 20% of the monitors have defects. How many monitors from this group have defects?

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5–5 Problem-Solving Investigation: Reasonable Answers

EXAMPLE

MAIN IDEA

- Determine whether answers are reasonable.

Standard 7MR3.1 Evaluate the reasonableness of the solution in the context of the original situation.
Standard 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in** estimations, **computations, and applications.**

SHOPPING Cara sees an advertisement for a pair of shoes. One pair costs $34.99 plus 5 percent tax. She wants to buy a black pair and a brown pair. Cara has $75 saved in her clothing budget. Can she afford both pairs of shoes?

EXPLORE You know the cost of the shoes and the sales tax rate. You want to know if two pairs of shoes plus sales tax will be [ ] or [ ] than [ ].

PLAN Use [ ] to determine a reasonable answer.

SOLVE THINK $34.99 \times 2 \approx$ [ ]

10% of $70 = $7, so 5% of $70 = [ ]

The total cost will be about $70 + $3.50 = [ ]. Since Cara has $75, she will have enough to buy [ ].

CHECK Find the [ ] of the two pairs of shoes. Then compute the sales tax and compare the sum to $75.

Check Your Progress **SHOPPING** David wants to buy a CD for $11.99 and a pack of batteries for $3.99. The sales tax rate is 5 percent. If David has $17 in his wallet, will he have enough to buy the CD and batteries?

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5–6 Percent and Estimation

Standard 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in estimations,** computations, **and applications.**

MAIN IDEA

- Estimate by using equivalent fractions, decimals, and percents.

BUILD YOUR VOCABULARY (pages 116–117)

Compatible numbers are two numbers that are easy to add, subtract, multiply, or divide mentally.

EXAMPLES Estimate Percents of Numbers

Estimate.

1 **48% of 70**

48% is about ☐ or ☐. ☐ and 70 are compatible numbers.

☐ of 70 is ☐.

So, 48% of 70 is about ☐.

2 **12% of 81**

12% is about 12.5% or ☐, ☐ and ☐ are compatible numbers.

and 81 is about ☐.

☐ of ☐ is ☐.

So, 12% of 81 is about ☐.

3 **23% of 82**

23% is about $\frac{1}{4}$, and 82 is about ☐. $\frac{1}{4}$ and ☐ are compatible numbers.

$\frac{1}{4}$ of ☐ is ☐.

So, 23% of 82 is about ☐.

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Check Your Progress **Estimate.**

a. 51% of 60 **b.** 25% of 33 **c.** 34% of 59

EXAMPLE

4 **POPULATION** **About 9% of the population of Texas lives in the city of Houston. If there are about 22 million people in the state of Texas, estimate the population of Houston.**

9% of 22 million ≈ ____ or ____ of 22 million 9% is about ____

= ____ ____ × 22 = ____

So, the population of Houston is about ____.

Check Your Progress **LEFT-HANDEDNESS** About 11% of the population is left-handed. If there are about 17 million people in Florida, about how many Florida residents are left-handed?

EXAMPLES **Estimate Percents**

Estimate each percent.

5 **12 out of 47**

$\frac{12}{47} \approx$ ____ or $\frac{1}{4}$ 47 is about ____.

$\frac{1}{4} =$ ____%

So, 12 out of 47 is about ____.

FOLDABLES

ORGANIZE IT

Include the meaning of the symbol "≈." You may wish to include an example of estimating a percent in which the symbol ≈ is used.



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6 **41 out of 200**

$\frac{41}{200} \approx$ ☐ or $\frac{1}{5}$ 41 is about ☐.

$\frac{1}{5} =$ ☐

So, 41 out of 200 is about ☐.

7 **58 out of 71**

$\frac{58}{71} \approx$ ☐ or $\frac{5}{6}$ 58 is about ☐, and 71 is about ☐.

$\frac{5}{6} =$ ☐ %

So, 58 out of 71 is about ☐.

Check Your Progress **Estimate each percent.**

a. 15 out of 76

b. 14 out of 47

c. 58 out of 121

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5–7 Algebra: The Percent Equation

Standard 7NS1.3 Convert fractions to decimals and **percents** and **use these representations in** estimations, **computations, and applications.** **Standard 7NS1.7 Solve problems that involve** discounts, markups, **commissions, and profit** and compute simple and compound interest.

MAIN IDEA

- Solve problems using the percent equation.

BUILD YOUR VOCABULARY (pages 116–117)

The **percent equation** is an equivalent form of the percent proportion in which the _____ is written as a _____.

REVIEW IT

Explain how to write a decimal as a percent. *(Lesson 5-2)*

_____

_____

_____

_____

_____

EXAMPLE 1 Find the Part

Find 30% of 450.

Estimate 10% of 450 is 45. So, 30% of 450 is 3 • 45 or 135.

The percent is _____. The whole is _____. You need to find the part. Let n represent the part.

$\text{part} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$n =$ _____ • _____ Write the percent equation.

$n =$ _____ Multiply.

So, 30% of 450 is _____.

EXAMPLE 2 Find the Percent

102 is what percent of 150?

Estimate $\frac{102}{150} \approx \frac{100}{150}$ or $66\frac{2}{3}\%$

The part is _____. The whole is _____. You need to find the percent. Let n represent the percent.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

_____ $= n \cdot$ _____ Write the percent equation.

$\frac{105}{150} = \frac{150n}{150}$ Divide each side by 150.

_____ $= n$ Simplify.

Since _____ = _____%, 102 is _____% of 150.

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FOLDABLES

ORGANIZE IT

Write the percent equation in words and symbols. Explain why the rate in a percent equation is usually written as a decimal.



EXAMPLE **Find the Base**

3 **144 is 45% of what number?**

Estimate 144 is 50% of 288.

The part is ____. The percent is ____. You need to find the whole. Let n represent the whole.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$\square = \square \cdot n$ Write the percent equation.

$\frac{144}{0.45} = \frac{0.45n}{0.45}$ Divide each side by 0.45.

$\square = n$ Simplify.

So, 144 is 45% of ____.

Check Your Progress **Find the part, percent, or base.**

a. Find 20% of 315.

b. 135 is what percent of 250?

c. 186 is 30% of what number?

EXAMPLE **Solve a Real-Life Problem**

4 **SALES TAX** **The price of a sweater is $75. The sales tax is $5\frac{3}{4}$%. What is the total price of the sweater?**

You need to find what amount is $5\frac{3}{4}$% of $75.

Let t = the amount of tax.

$t = \square \cdot \square$ Write the equation.

$t = \square$ Simplify.

The amount of tax is ____. The total cost of the sweater is $75 + ____ or ____.

Check Your Progress The price of a pair of shoes is $60. The sales tax is 5 percent. What is the total price of the shoes?

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5–8 Percent of Change

Standard 7NS1.6 Calculate the percentage of increases and decreases of a quantity. **Standard 7NS1.7 Solve problems that involve discounts, markups,** commissions, and profit and compute simple and compound interest.

MAIN IDEA

- Find and use the percent of increase or decrease.

KEY CONCEPT

Percent of Change A percent of change is a ratio that compares the change in quantity to the original amount.

BUILD YOUR VOCABULARY (pages 116–117)

A **percent of change** is a ____ that compares the change in quantity to the original amount. When the new amount is ____ than the original, the percent of change is called a **percent of increase.**

When the new amount is ____ than the original, the percent of change is called a **percent of decrease.**

EXAMPLE **Find the Percent of Increase**

1 HOMES **The Neitos bought a house several years ago for $120,000. This year, they sold it for $150,000. Find the percent of change. State whether the change is an increase or decrease.**

Step 1 The amount of change is $150{,}000 - 120{,}000 =$ ____

Step 2 Percent of change $= \dfrac{\text{amount of change}}{\text{original amount}}$ Definition of percent of change

$= \dfrac{\square}{\square}$

$= 0.25$ Divide.

Step 3 The decimal 0.25 written as a percent is ____. So, the percent of change is ____.

The new amount is ____ than the original. The percent of ____ is 25%.

Check Your Progress **CLUBS** Last year Cedar Park Swim Club had 340 members. This year they have 391 members. Find the percent increase.

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FOLDABLES™

ORGANIZE IT

Be sure to include an explanation and examples showing the difference between percent of increase and percent of decrease.



EXAMPLE **Find the Percent of Change**

2 **SCHOOLS** **Johnson Middle School had 240 students last year. This year, there are 192 students. Find the percent of change. State whether the percent of change is an increase or a decrease.**

Step 1 The amount of change is $240 - 192 =$ ☐.

Step 2 Percent of change $= \dfrac{\text{amount of change}}{\text{original amount}}$

$= \dfrac{\square}{\square}$

$= 0.20$ Divide.

Step 3 The decimal 0.20 written as a percent is ☐.

The percent of change is ☐. Since the new amount is ☐ than the original, it is a percent of ☐.

Check Your Progress **CARS** Meagan bought a new car several years ago for $14,000. This year she sold the car for $9,100. Find the percent of change. State whether the percent of change is an *increase* or a *decrease*.

BUILD YOUR VOCABULARY (pages 116–117)

The **markup** is the amount the price of an item is ☐ above the price the store ☐ for the item.

The **selling price** is the amount the ☐ pays.

The amount by which a ☐ is ☐ is called the **discount.**

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EXAMPLE **Find the Selling Price**

REMEMBER IT

There may be more than one way to solve a problem. See pages 286 and 287 of your textbook for other methods you can use to solve Examples 3 and 4.

3 MARKUP **Shirts bought by a sporting goods store cost them $20 per shirt. They want to mark them up 40%. What will be the selling price?**

METHOD 1 Find the amount of the markup first.

The whole is ☐. The percent is ☐. You need to find the amount of the markup, or the part. Let m represent the amount of the markup.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$m = \square \cdot \square$ Write the equation.

$m = \square$ Multiply.

Add the markup ☐ to the cost of each shirt to find the selling price. ☐ + ☐ = ☐

METHOD 2 Find the total percent first.

The customer will pay 100% of the store's cost plus an extra 40% of the cost. Find 100% + 40% or 140% of the store's cost. Let p represent the price.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$p = \square \cdot \square$ Write the equation.

$p = \square$ Multiply.

The selling price of the shirts for the customer is ☐.

Check Your Progress Silk flowers bought by a craft store cost them $10 per yard. They want to mark them up 35 percent. What will be the selling price?

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EXAMPLE **Find the Sale Price**

4 SHOPPING **A computer usually sells for $1,200. This week, it is on sale for 30% off. What is the sale price?**

METHOD 1 Find the amount of the discount first.

The percent is ☐, and the whole is ☐. We need to find the amount of the discount, or the part. Let d represent the amount of discount.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$d = \square \cdot \square$ Write the equation.

$d = \square$ Multiply.

Subtract the amount of the discount from the original price to find the sale price.

☐ − ☐ = ☐

METHOD 2 Find the percent paid first.

If the amount of the discount is 30%, the percent paid is 100% − 30% or 70%. Find 70% of $1,200. Let s represent the sale price.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$s = \square \cdot \square$ Write the equation.

$s = \square$ Multiply.

The sale price of the computer is ☐.

Check Your Progress A DVD sells for $28. This week it is on sale for 20% off. What is the sale price?

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5–9 Simple Interest

Standard 7NS1.7 Solve problems that involve discounts, markups, commissions, and profit and **compute simple** and compound **interest.**

MAIN IDEA

- Solve problems involving simple interest.

BUILD YOUR VOCABULARY (pages 116–117)

Interest is the amount of money paid or _____ for the use of money.

Principal is the amount of money _____ or borrowed.

EXAMPLE Find Simple Interest

1 **Find the simple interest for $2,000 invested at 5.5% for 4 years.**

$I = prt$ Write the simple interest formula.

$I =$ _____ $\cdot$ _____ $\cdot$ _____ Replace p with _____, r with _____, and t with _____.

$I =$ _____ The simple interest is _____.

EXAMPLE Find the Total Amount

REMEMBER IT

The t in the simple interest formula represents time in years. If time is given in months, weeks, or days, the time must be changed to time in years.

2 **STANDARDS EXAMPLE** **Find the total dollar amount in an account where $80 is invested at a simple annual interest rate of 6% for 6 months.**

A. $41.20 **B.** $82.40 **C.** $84.80 **D.** $108.80

Read the Test Item

You need to find the total amount in an account. The time is given in months. Six months is $\frac{6}{12}$ or _____ year.

Solve the Test Item

$I = prt$

$I =$ _____ $\cdot$ _____ $\cdot$ _____

$I =$ _____

The amount in the account is $80 + _____ or _____.

The correct answer is choice _____.

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FOLDABLES™

ORGANIZE IT

Explain what you have learned about computing simple interest. Be sure to include the simple interest formula.



Check Your Progress

a. Find the simple interest for $1,500 invested at 5% for 3 years.

b. Find the total amount of money in an account where $60 is invested at 8% for 3 months.

EXAMPLE **Find the Interest Rate**

3 LOANS **Gerardo borrowed $4,500 from his bank for home improvements. He will repay the loan by paying $120 a month for the next four years. Find the simple interest rate of the loan.**

Use the formula $I = prt$. To find I, first find the total amount of money Gerardo will pay.

$\$120 \cdot 48 =$ ____.

He will pay ____ $- \$4{,}500$ or ____ in interest.
So $I = 1{,}260$.

The principle is $4,500. So, $p = 4{,}500$. The loan will be for 48 months or 4 years. So, $t = 4$.

$I = \quad p \quad \cdot r \cdot \quad t$

____ $=$ ____ $\cdot r \cdot$ ____

____ $=$ ____ Simplify.

____ $=$ ____ Divide each side by 18,000.

____ $= r$ Simplify.

The simple interest rate is ____.

Check Your Progress Jocelyn borrowed $3,600 from her bank for home improvements. She will repay the loan by paying $90 a month for the next 5 years. Find the simple interest rate of the loan.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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CHAPTER 5

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 5 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 5, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 116–117)* to help you solve the puzzle.

5-1 Ratios and Percents

Write each ratio or fraction as a percent.

1. 21 out of 100 **2.** 4:10 **3.** $\frac{9}{25}$

Write each percent as a fraction in simplest form.

4. 27% **5.** 50% **6.** 80%

5-2 Fractions, Decimals, and Percents

Write each percent as a decimal.

7. 29% **8.** 376% **9.** 5%

Write each decimal or fraction as a percent.

10. 3.9 **11.** $\frac{7}{8}$ **12.** $\frac{1}{3}$

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5-3 The Percent Proportion

Solve.

13. What percent of 48 is 6?

14. 14 is 20% of what number?

5-4 Finding Percents Mentally

Complete each statement.

15. 40% of 25 = ____ of 25 or ____

16. ____ of 36 = $\frac{1}{4}$ of 36 or ____

17. $66\frac{2}{3}$% of 48 = ____ of 48 or ____

18. ____ of 89 = 0.1 of 89 or ____

5-5 Problem-Solving Investigation: Reasonable Answers

19. **AGRICULTURE** An orange grower harvested 1,260 pounds of oranges from one grove, 874 pounds from another, and 602 pounds from a third. What is a reasonable number of crates to have on hand if each crate holds 14 pounds of oranges?

5-6 Percent and Estimation

20. Are $\frac{1}{8}$ and 56 compatible numbers? Explain.

21. Describe how to estimate 65% of 64 using compatible numbers.

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5-7

The Percent Equation

Write each percent proportion as a percent equation.

22. $\frac{16}{64} = \frac{25}{100}$

23. $\frac{a}{14} = \frac{2}{100}$

24. $\frac{96}{b} = \frac{48}{100}$

25. $\frac{13}{100} = \frac{p}{675}$

5-8

Percent of Change

Find the percent of change. Round to the nearest tenth if necessary. State whether the change is an *increase* or *decrease*.

29. Original: 29
New: 64

30. Original: 51
New: 42

31. Find the selling price for the sweater.

Cost to store: $15
Mark up: 35%

5-9

Simple Interest

Write *interest* or *principal* to complete each sentence.

32. _____ is the amount of money paid or earned for the use of money.

33. _____ equals _____ times rate times time.

34. Find the total amount in the account where $560 is invested at 5.6% for 6 months.

First, find the _____ earned. Then, add the _____ earned and the _____ to find the total amount in the account. What is the total amount for $560 at 5.6% for 6 months? _____

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CHAPTER 5 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your text book, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 5.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 5 Practice Test on page 299 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 5 Study Guide and Review on pages 295–298 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may want to take the Chapter 5 Practice Test on page 299.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 5 Foldable.
- Then complete the Chapter 5 Study Guide and Review on pages 295–298 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may want to take the Chapter 5 Practice Test on page 299.

Student Signature

Parent/Guardian Signature

Teacher Signature

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CHAPTER 6

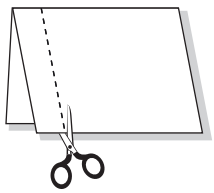
Geometry and Spatial Reasoning

FOLDABLES™

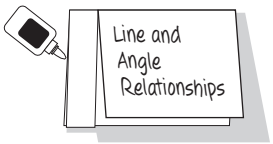
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with 7 sheets of $8\frac{1}{2}$" × 11" paper.

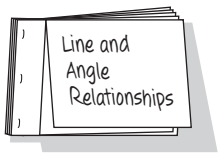
STEP 1 **Fold** a sheet of paper in half lengthwise. Cut a 1" tab along the left edge through one thickness.



STEP 2 **Glue** the 1" tab down. Write the lesson title on the front tab.



STEP 3 **Repeat** Steps 1–2 for the remaining sheets of paper. Staple together to form a booklet.



NOTE-TAKING TIP: When you read and learn new concepts, help yourself remember these concepts by taking notes, writing definitions and explanations, and draw models as needed.

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CHAPTER 6

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 6. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
angle			
collinear			
complementary angles			
congruent angles			
congruent polygon			
equiangular			
equilateral			
equilateral triangle			
line			
line of reflection			
line of symmetry			

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Vocabulary Term	Found on Page	Definition	Description or Example
line symmetry			
obtuse triangle			
plane			
point			
ray			
reflection			
regular polygon			
supplementary angles			
transformation			
translation			
vertical angles			

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6–1 Line and Angle Relationships

Standard 7MG3.1 Identify and construct **basic elements of geometric figures** (e.g., altitudes, midpoints, diagonals, angle bisectors, and perpendicular bisectors; central angles, radii, diameters, and chords of circles) by using a compass and straightedge.

Main Idea

- Identify special pairs of angles and relationships of angles formed by two parallel lines cut by a transversal.

Key Concepts

Special Pairs of Angles

Vertical angles are opposite angles formed by intersecting lines. Vertical angles are congruent.

The sum of the measures of **supplementary angles** is 180°.

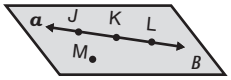
The sum of the measures of **complementary angles** is 90°.

Build Your Vocabulary (pages 144–145)

A ____ is simply a location that has neither shape nor size. A ____ is made up of points and has no thickness or width. A ____ is a flat surface made up of points that extends infinitely in all directions.

Examples Name Lines and Planes

Use the figure to name each of the following.



1 a line containing point *L*

There are ____ points on the line. Any ____ of the points can be used to name the line.

$\overleftrightarrow{JK}$, ____, $\overleftrightarrow{KJ}$, ____, $\overleftrightarrow{LK}$, ____.

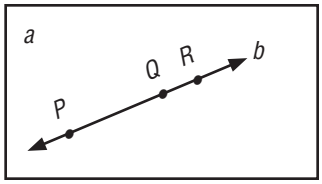
The line can also be named as line ____.

2 a plane containing point *L*

The plane can be named as plane ____. You can also use the letters of any three points to name the plane.

plane ____, plane ____, plane ____

Check Your Progress **Use the figure at the right to name each of the following.**



a. a line containing point *P*

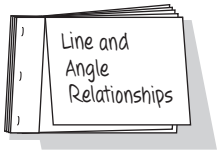
b. a plane containing point *P*

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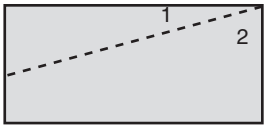
ORGANIZE IT

Use sketches and words to define the lines and angles discussed in this lesson. Try to show relationships among different lines and angles. Write this in your Foldable.



EXAMPLE

3 **SEWING** **The drawing shows a piece of fabric marked for cutting. If the edges of the fabric meet at right angles and $m\angle 1 = 15°$, classify the relationship between $\angle 1$ and $\angle 2$. Then find $m\angle 2$.**

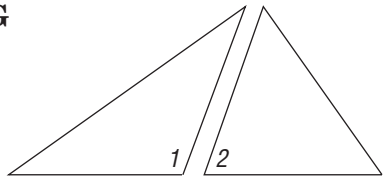


$\angle 1$ and $\angle 2$ are ____ angles. The sum of their angle measures is ____.

$m\angle 1 + m\angle 2 = 90$	Write the equation.
$\square + x = 90$	$m\angle 1 =$ ____ and $m\angle 2 = x$
$-15 = -15$	Subtract ____ from each side.
$x = 75$	Simplify.

So, the measure of $\angle 2$ is ____.

Check Your Progress **SEWING** **The drawing shows two pieces of fabric that are being sewn together to use in a quilt. If the edges of the fabric meet at a straight angle and $m\angle 2 = 75°$, classify the relationship between $\angle 1$ and $\angle 2$. Then find $m\angle 1$.**

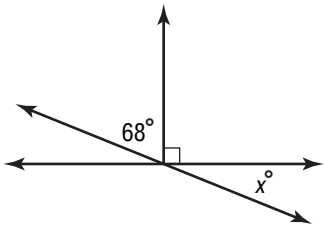


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EXAMPLE **Find a Missing Angle Measure**

4 **Find the value of x in the figure.**

Use the two vertical angles to solve for x.

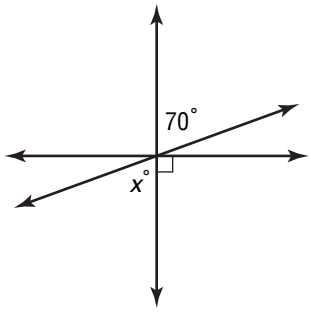


$\square + x = \square$ Write an equation.

$-68 \qquad -68$ Subtract 68 from each side.

$x = \square$ Simplify.

Check Your Progress Find the value of x in the figure.



HOMEWORK ASSIGNMENT

Page(s):

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6–2 Problem-Solving Investigation: Use Logical Reasoning

EXAMPLE Use Logical Reasoning

MAIN IDEA
- Solve problems by using logical reasoning.

Standard 7MR1.2 Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
Standard 7NS1.3 Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.

FOOD **Mona, Sharon, Pat, and Dena each have a favorite food. One likes pizza, another fish and chips, another chicken, and another hamburgers. From the given clues, give each person's favorite food.**

- **Pat does not like pizza, hamburgers, or fish and chips.**
- **Neither Mona nor Dena likes hamburgers.**
- **Mona does not like to eat fried food.**

EXPLORE You know that each of the four students has a particular favorite food. Use the clues given and logical reasoning to determine the favorite food of each student.

PLAN Read each clue and deduce what you know about the favorite foods of the students.

SOLVE According to the first clue, Pat does not like pizza, hamburgers, or fish and chips. The only other option is _____, so Pat likes _____.

Since neither Mona nor Dena likes hamburgers, that means that _____ must like hamburgers.

Finally, there are two students left, Mona and Dena, and two food choices left, pizza and fish and chips. Since Mona does not like _____, she must like _____. Dena likes _____.

CHECK Read each clue again and make sure the answers seem reasonable.

Check Your Progress **SPORTS** Craig, Amy, Julia, and Ronaldo each have a favorite sport. One likes soccer, another basketball, another tennis, and another skateboarding. From the given clues, give each person's favorite sport.

- Amy does not like soccer, basketball, or skateboarding.
- Neither Craig nor Ronaldo likes playing soccer.
- Craig prefers individual sports as opposed to team sports.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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6–3 Polygons and Angles

MAIN IDEAS

- Find the sum of angle measures of a polygon.
- Find the measure of an interior angle of a polygon.

KEY CONCEPT

Interior Angle Sum of a Polygon

The sum of the measures of the interior angles of a polygon is $(n - 2)180$, where n is the number of interior angles in the polygon.

Standard 7MR3.3 Develop generalizations of the results obtained and the strategies used and apply them to new problem situations. Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.

EXAMPLE Find the Sum of Interior Angle Measures

1 **Find the sum of the measures of the interior angles of a hexagon.**

A hexagon has ☐ sides.

$S = (n - 2)180$ Write an equation.

$S = (\square - 2)180$ Replace n with ☐.

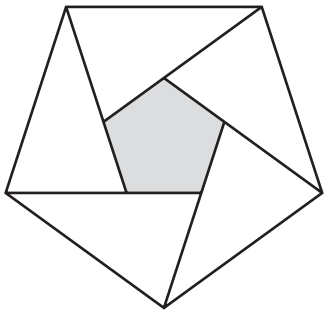
$S = (4)180$ or ☐ Simplify.

The sum of the measures of the interior angles of a hexagon is ☐.

Check Your Progress Find the sum of the measures of the interior angles of a heptagon (7-sided figure).

EXAMPLE Find the Measure of an Interior Angle

2 **DESIGN** **A designer is creating a new logo for a bank. The logo consists of a regular pentagon surrounded by isosceles triangles. Find the measure of an interior angle of a pentagon.**



A pentagon has ☐ sides.

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6–4 Congruent Polygons

Standard 7MG3.4 Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and **what congruence means about the relationships between the sides and angles of the two figures.**

MAIN IDEA

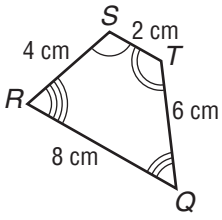
- Identify congruent polygons.

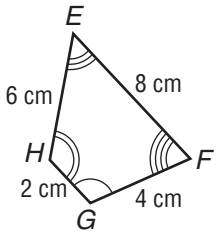
KEY CONCEPT

Congruent Polygons
If two polygons are congruent, their corresponding sides are congruent and their corresponding angles are congruent.

EXAMPLE **Identify Congruent Polygons**

1 **Determine whether the trapezoids shown are congruent. If so, name the corresponding parts and write a congruence statement.**





The arcs indicate that $\angle S \cong \angle G$,

$\angle T \cong \angle H$, $\angle Q \cong \angle E$, and _____.

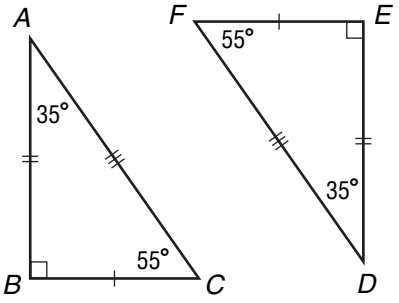
The side measures indicate that $\overline{ST} \cong \overline{GH}$,

$\overline{TQ} \cong \overline{HE}$, $\overline{QR} \cong \overline{EF}$, and _____.

Since _____ pairs of corresponding angles and sides are _____, the two trapezoids are _____.

One congruence statement is trapezoid $EFGH \cong$ trapezoid _____.

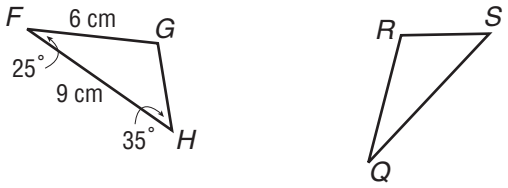
Check Your Progress Determine whether the triangles shown are congruent. If so, name the corresponding parts and write a congruence statement.



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EXAMPLES **Find Missing Measures**

In the figure, $\triangle FGH \cong \triangle QRS$



2 **Find $m\angle S$.**

According to the congruence statement, $\angle H$ and $\angle S$ are corresponding angles. So, ☐ ≅ ☐.

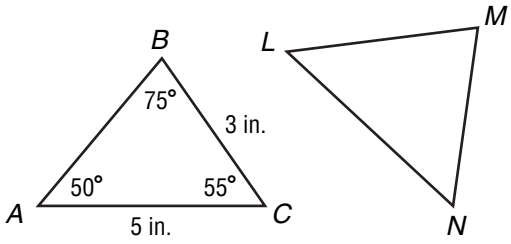
Since $m\angle H =$ ☐, $m\angle S =$ ☐.

3 **Find QR.**

$\overline{FG}$ corresponds to ☐. So, ☐ ≅ ☐.

Since $FG =$ ☐ centimeters, $QR =$ ☐ centimeters.

Check Your Progress **In the figure, $\triangle ABC \cong \triangle LMN$.**



a. Find $m\angle N$.

b. Find LN.

HOMEWORK ASSIGNMENT

Page(s):

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6–5 Symmetry

Standard 7MG3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.

MAIN IDEA
- Identify line symmetry and rotational symmetry.

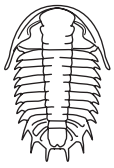
BUILD YOUR VOCABULARY (pages 144–145)

A figure has **line symmetry** if it can be folded over a line so that one half of the figure ____ the other half.

EXAMPLES Identify Line Symmetry

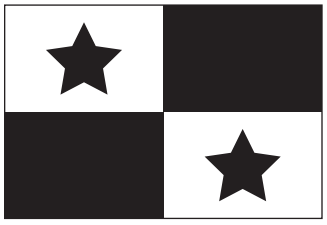
Determine whether each figure has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.

1



This figure has ____ line of symmetry.

2



This figure has ____ line of symmetry.

Check Your Progress

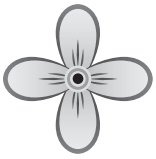
Determine whether the leaf has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.



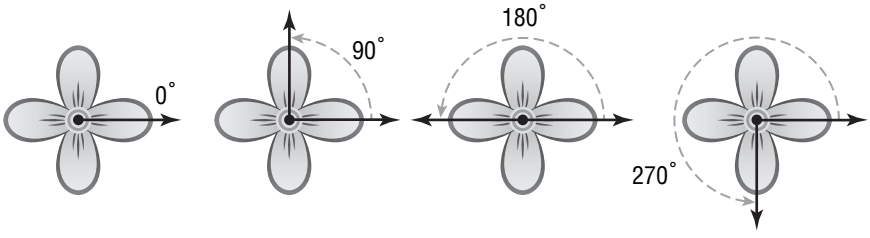
____

EXAMPLE Identify Rotational Symmetry

3 FLOWERS Determine whether the flower design has rotational symmetry. Write *yes* or *no*. If *yes*, name its angle(s) of rotation.



Yes, this figure has ____ symmetry. It will match itself after being rotated 90°, 180°, and ____.



WRITE IT

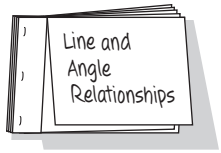
How many degrees does one complete turn of a figure measure? Why is it this number of degrees?

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FOLDABLES™

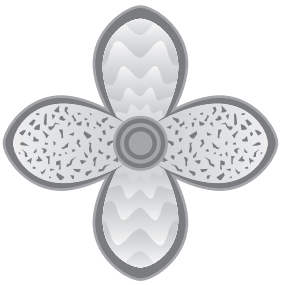
ORGANIZE IT

Use sketches and words to show lines of symmetry and line symmetry. Write this in your Foldable.

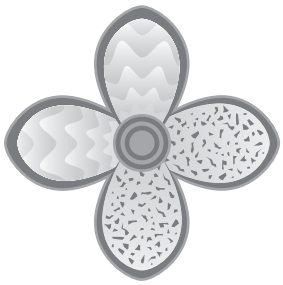


Check Your Progress **Determine whether each flower design has rotational symmetry. Write *yes* or *no*. If *yes*, name its angle(s) of rotation.**

a.



b.

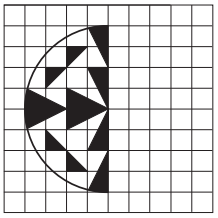


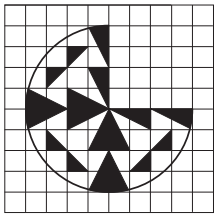
4 ARCHITECTURE **A rosette is a painted or sculptured ornament, usually circular, having designs that radiate symmetrically from the center. Copy and complete the picture of the rosette shown so that the completed figure has rotational symmetry with 90°, 180°, and 270° as its angles of rotation.**

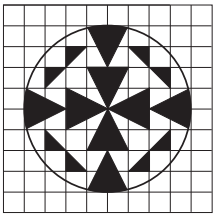


Use the procedure described above and the points indicated to rotate the figure 90°, 180°, and 270° counterclockwise. Use a 90° rotation clockwise to produce the same rotation as a 270° rotation counterclockwise.

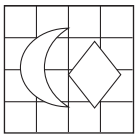
_____ counterclockwise _____ counterclockwise _____ clockwise







Check Your Progress **DESIGN** Copy and complete the figure so that the completed design has rotational symmetry with 90°, 180°, and 270° as its angles of rotation.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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6–6 Reflections

Standard 7MG3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, **and determine their image under translations** and reflections.

MAIN IDEA

- Graph reflections on a coordinate plane.

BUILD YOUR VOCABULARY (pages 144–145)

A **reflection** (sometimes called a *flip*) is a transformation in which a _____ image is produced by _____ a figure over a line.

KEY CONCEPT

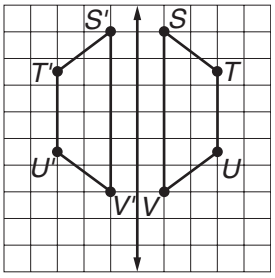
Properties of Reflections

1. Every point on a reflection is the same distance from the line of reflection as the corresponding point on the original figure.
2. The image is congruent to the original figure, but the orientation of the image is *different* from that of the original figure.

EXAMPLE 1 **Draw a Reflection**

Draw the image of trapezoid *STUV* after a reflection over the given line.

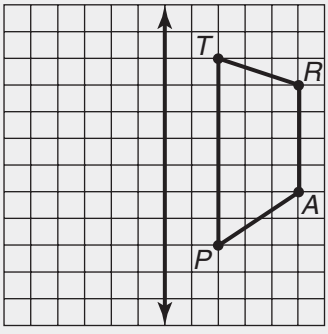
Step 1 Count the number of units between each vertex and the line of _____.



Step 2 Plot a point for each vertex the _____ distance away from the line on the other side.

Step 3 Connect the new _____ to form the image of trapezoid *STUV*, trapezoid *S'T'U'V'*.

Check Your Progress Draw the image of trapezoid *TRAP* after a reflection over the given line.

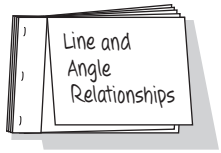


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FOLDABLES™

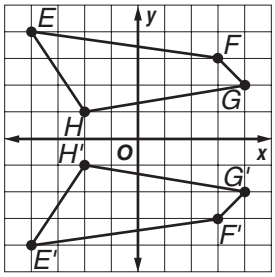
ORGANIZE IT

Draw a triangle or simple quadrilateral on graph paper. Reflect your figure over the *x*-axis. Add your work to your Foldable.



EXAMPLE **Reflect a Figure over the *x*-axis**

2 **Graph quadrilateral *EFGH* with vertices $E(-4, 4)$, $F(3, 3)$, $G(4, 2)$, and $H(-2, 1)$. Then graph the image of *EFGH* after a reflection over the *x*-axis and write the coordinates of its vertices.**



The coordinates of the vertices of the image are E' ____, F' ____, G' ____ and H' ____.

opposites
same

$E(-4, 4) \rightarrow E'(-4, -4)$

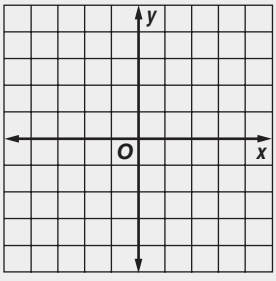
$F(3, 3) \rightarrow F'(3, -3)$

$G(4, 2) \rightarrow$ ____

$H(-2, 1) \rightarrow$ ____

Notice that the *y*-coordinate of a point reflected over the *x*-axis is the ____ of the *y*-coordinate of the original point.

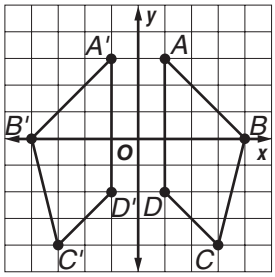
Check Your Progress Graph quadrilateral *QUAD* with vertices $Q(2, 4)$, $U(4, 1)$, $A(-1, 1)$, and $D(-3, 3)$. Then graph the image of *QUAD* after a reflection over the *x*-axis, and write the coordinates of its vertices.



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EXAMPLE **Reflect a Figure over the *y*-axis**

3 **Graph trapezoid *ABCD* with vertices *A*(1, 3), *B*(4, 0), *C*(3, −4), and *D*(1, −2). Then graph the image of *ABCD* after a reflection over the *y*-axis, and write the coordinates of its vertices.**



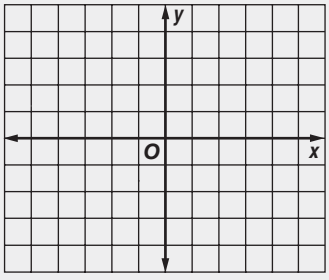
The coordinates of the vertices of the image are A' _____, B' _____, C' _____, and D' _____.

opposites
same

$A(1, 3)$	$A'(-1, 3)$
$B(4, 0)$	$B'(-4, 0)$
$C(3, -4)$	
$D(1, -2)$	

Notice that the *x*-coordinate of a point reflected over the *y*-axis is the opposite of the *x*-coordinate of the _____ point.

Check Your Progress Graph quadrilateral *ABCD* with vertices $A(2, 2)$, $B(5, 0)$, $C(4, -2)$, and $D(2, -1)$. Then graph the image of ABCD after a reflection over the *y*-axis, and write the coordinates of its vertices.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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6–7 Translations

Standard 7MG3.2 Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, **and determine their image under translations** and reflections.

MAIN IDEA

- Graph translations on a coordinate plane.

BUILD YOUR VOCABULARY (pages 144–145)

A **translation** (sometimes called a *slide*) is the _____ of a figure from one position to another _____ turning it.

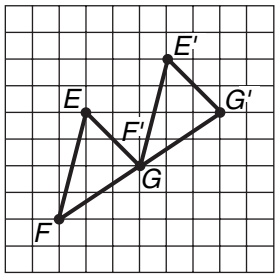
KEY CONCEPT

Properties of Translations

1. Every point on the original figure is moved the same distance and in the same direction.
2. The image is congruent to the original figure, and the orientation of the image is the same as that of the original figure.

EXAMPLE 1 **Draw a Translation**

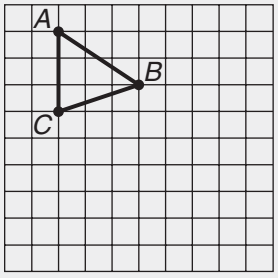
Draw the image of $\triangle EFG$ after a translation of 3 units right and 2 units up.



Step 1 Move each vertex of the triangle _____ units right and _____ units up.

Step 2 Connect the new vertices to form the _____.

Check Your Progress Draw the image of $\triangle ABC$ after a translation of 2 units right and 4 units down.

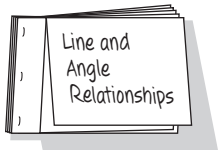


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FOLDABLES

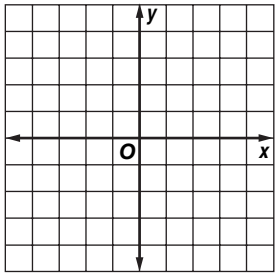
ORGANIZE IT

Draw a triangle or simple quadrilateral on graph paper. Then draw a translation. Show how you determined the points needed to graph the translated figure. Put your work in your Foldable.



EXAMPLE **Translation in the Coordinate Plane**

2 **Graph $\triangle ABC$ with vertices $A(-2, 2)$, $B(3, 4)$, and $C(4, 1)$. Then graph the image of $\triangle ABC$ after a translation of 2 units left and 5 units down. Write the coordinates of its vertices.**

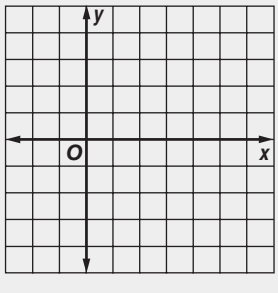


The coordinates of the vertices of the image are

A' _____, B' _____, and C' _____. Notice that these vertices can also be found by adding _____ to the x-coordinates and _____ to the y-coordinates, or $(-2, -5)$.

Original	Add $(-2, -5)$	Image
$A(-2, 2) \longrightarrow$	$(-2 + (-2), 2 + (-5)) \longrightarrow$	
$B(3, 4) \longrightarrow$	$(3 + (-2), 4 + (-5)) \longrightarrow$	
$C(4, 1) \longrightarrow$	$(4 + (-2), 1 + (-5)) \longrightarrow$	

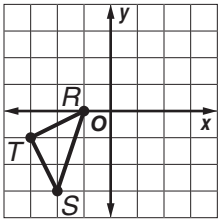
Check Your Progress Graph $\triangle PQR$ with vertices $P(-1, 3)$, $Q(2, 4)$, and $R(3, 2)$. Then graph the image of $\triangle PQR$ after a translation of 2 units right and 3 units down. Write the coordinates of its vertices.



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EXAMPLE

3 STANDARDS EXAMPLE **If triangle *RST* is translated 4 units right and 3 units up, what are the coordinates of point *T′*?**



A (0, 3)
B (1, 2)
C (2, 1)
D (1, 1)

Read the Test Item

You are asked to find the coordinates of point T' after the original figure has been translated 4 units right and 3 units up.

Solve the Test Item

You can answer this question without translating the entire triangle.

The coordinates of point T are ____.

Original figure

The x-coordinate of T' is ____, so the same x-coordinate of T' is ____ + 4 or ____.

Translating 4 units right is the as ____ to the x-coordinate.

The y-coordinate of T is ____, so the y-coordinate of T' is ____ + 3 or ____.

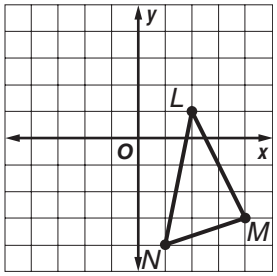
Translating 3 units up is the same as adding ____ to the y-coordinate.

The coordinates of T' are ____.

The answer is ____.

Check Your Progress

If triangle *LMN* is translated 4 units left and 2 units up, what are the coordinates of point *L′*?



F (0, −1)
G (−3, 2)
H (−1, −4)
J (−2, 3)

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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CHAPTER 6

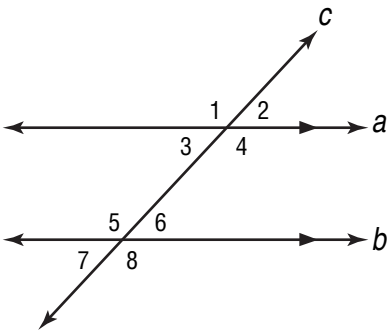
BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 6 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 6, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 144–145*) to help you solve the puzzle.

6-1 Line and Angle Relationships

For Questions 1–4, use the figure at the right.



1. Classify the relationship between $\angle 5$ and $\angle 6$.

2. Classify the relationship between $\angle 5$ and $\angle 8$.

3. Find $m\angle 3$ if $m\angle 2 = 60°$.

4. Find $m\angle 4$ if $m\angle 2 = 60°$.

6-2 Problem-Solving Investigation: Use Logical Reasoning

5. **BASKETBALL** Juan, Dallas, and Scott play guard, forward, and center on a team, but not necessarily in that order. Juan and the center drove Scott to practice on Saturday. Juan does not play guard. Who is the guard?

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6-3

Polygons and Angles

Find the sum of the measures of the interior angles of each polygon.

6. heptagon

7. nonagon

8. 15-gon

Find the measure of one interior angle in each regular polygon.

9. hexagon

10. decagon

11. 18-gon

6-4

Congruent Polygons

12. Complete the sentence. Two polygons are congruent if their _____ sides are congruent and the corresponding angles are _____.

△ABC ≅ △EDF. m∠A = 40° and m∠B = 50°. ∠E ≅ ∠A and ∠F ≅ ∠C.

13. What is $m\angle C$?

14. What is $m\angle D$?

6-5

Symmetry

Write whether each sentence is *true* or *false*. If *false*, replace the underlined words to make a true sentence.

15. A figure has line symmetry if it can be folded over a line so that one half of the figure matches the other half.

16. To rotate a figure means to turn the figure from its center.

17. A figure has rotational symmetry if it first matches itself after being rotated exactly 360°.

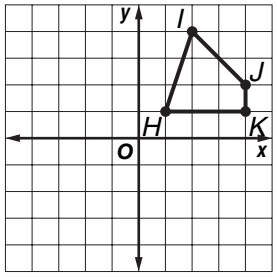
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6-6

Reflections

18. Complete. A reflection is a _____ image of a figure produced by flipping the figure over a line.

19. If you graphed quadrilateral *HIJK* reflected over the *y*-axis, what would be the coordinates of these vertices:



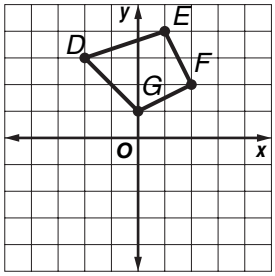
H'(_____) J'(_____)

6-7

Translations

20. Complete. A translation is the movement of a figure from one position to another _____ turning it.

21. If you graphed the image of quadrilateral *DEFG* after a translation 3 units right and 4 units down, what would be the coordinates of these vertices:



D'(_____) F'(_____)

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CHAPTER 6 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 6.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want take the Chapter 6 Practice Test on page 347 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 6 Study Guide and Review on pages 342–346 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 6 Practice Test on page 347.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 6 Foldable.
- Then complete the Chapter 6 Study Guide and Review on pages 342–346 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 6 Practice Test on page 347.

Student Signature

Parent/Guardian Signature

Teacher Signature

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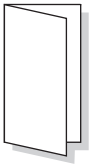
CHAPTER 7

Geometry: Measurement: Area and Volume

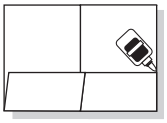
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain piece of 8 $\frac{1}{2}$" × 11" paper.

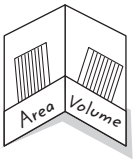
STEP 1 **Fold** in half widthwise.



STEP 2 **Open** and fold the bottom to form a pocket. Glue edges.



STEP 3 **Label** each pocket. Place several index cards in each pocket.



NOTE-TAKING TIP: As you read and learn a new concept, such as how to measure area or volume, write examples and explanations showing the main ideas of the concept.

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CHAPTER 7

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 7. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
base			
center			
circumference			
chord			
complex figure			
cone			
cylinder			
diameter			
edge			
face			
lateral face			
lateral surface area			

(continued on the next page)

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Vocabulary Term	Found on Page	Definition	Description or Example
net			
pi			
plane			
prism			
pyramid			
radius			
regular pyramid			
similar solids			
slant height			
total surface area			
vertex			
volume			

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7–1 Circumference and Area of Circles

Main Idea

- Find the circumference and the area of circles.

Build Your Vocabulary (pages 167–168)

The **radius** of a circle is the distance from the _____ to any point _____ the circle. A _____ is any segment with endpoints on the circle.

The **diameter** of a circle is the _____ the circle through the center.

The **circumference** of a circle is the _____ the circle.

Key Concepts

Circumference of a Circle The circumference C of a circle is equal to its diameter d times π, or 2 times its radius r times π.

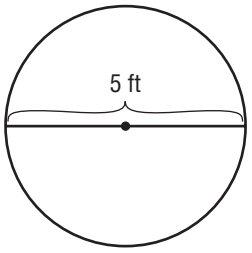
Area of a Circle The area A of a circle is equal to π times the square of the radius r.

Standard 7MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, **including** rectangles, parallelograms, trapezoids, squares, triangles, **circles,** prisms, and cylinders. **Standard 7MG3.1 Identify** and construct **basic elements of geometric figures** (e.g., altitudes, midpoints, diagonals, angle bisectors, and perpendicular bisectors; central angles, **radii, diameters, and chords of circles**) by using a compass and straightedge.

Examples Find the Circumferences of Circles

Find the circumference of each circle. Round to the nearest tenth.

1



$C =$ _____ Circumference of a circle

$C =$ _____ $\cdot$ _____ Replace d with _____.

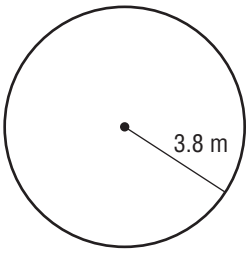
$C =$ _____ This is the *exact* circumference.

Use a calculator to find 5π.

5 × π ENTER = 15.70796327

The circumference is about _____.

2



$C =$ _____ Circumference of a circle

$C = 2 \cdot \pi \cdot$ _____ Replace r with _____.

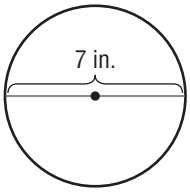
$C \approx$ _____ Use a calculator.

The circumference is about _____.

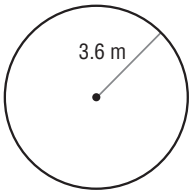
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Check Your Progress **Find the circumference of each circle. Round to the nearest tenth.**

a.



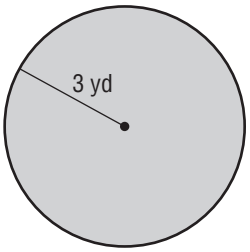
b.



EXAMPLES **Find the Areas of Circles**

Find the area of each circle. Round to the nearest tenth.

3



$A =$ ☐ Area of a circle

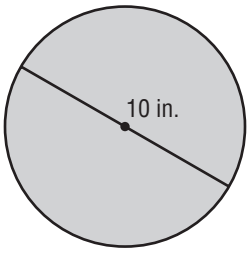
$A = \pi \cdot$ ☐^{2} Replace r with ☐.

$A = \pi \cdot$ ☐ Evaluate 3^2.

$A \approx$ ☐ Use a calculator.

The area is about ☐.

4



$A = \pi r^2$ Area of a circle

$A = \pi \cdot$ ☐^{2} $r = \frac{1}{2}$ of 10

$A = \pi \cdot$ ☐ Evaluate 5^2.

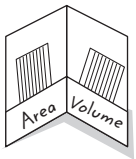
$A \approx$ ☐ Use a calculator.

The area is about ☐.

FOLDABLES

ORGANIZE IT

On index cards, write the formulas for finding the circumference and area of a circle. Sketch a circle and label its parts. Place your cards in the "Area" pocket of your Foldable.



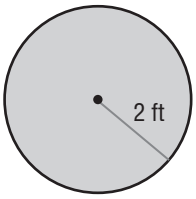
HOMEWORK ASSIGNMENT

Page(s):

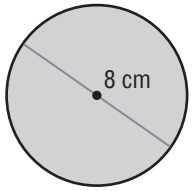
Exercises:

Check Your Progress **Find the area of each circle. Round to the nearest tenth.**

a.



b.



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7–2 Problem-Solving Investigation: Solve a Simpler Problem

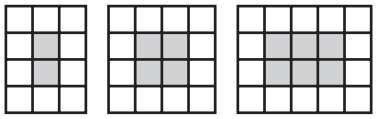
MAIN IDEA

- Solve problems by solving a simpler problem.

Standard 7MR1.3 Determine when and how to break a problem into simpler parts.
Standard 7MR2.2 Apply strategies and results from simpler problems to more complex problems.
Standard 7AF4.2 Solve multistep problems involving rate, average speed, distance, and time or **a direct variation.**

EXAMPLE

GARDENS **A series of gardens framed by tiles is arranged such that each successive garden is one tile longer than the previous garden. The width of the gardens is four tiles. The first three gardens are shown below. How many tiles surround Garden 10?**



Garden 1 Garden 2 Garden 3

EXPLORE You know how many tiles surround the first three gardens. Use this information to predict how many tiles will surround Garden 10.

PLAN It would take a long time to draw each of the gardens 1 through 10. Instead, find the number of tiles surrounding the smaller gardens and look for a pattern.

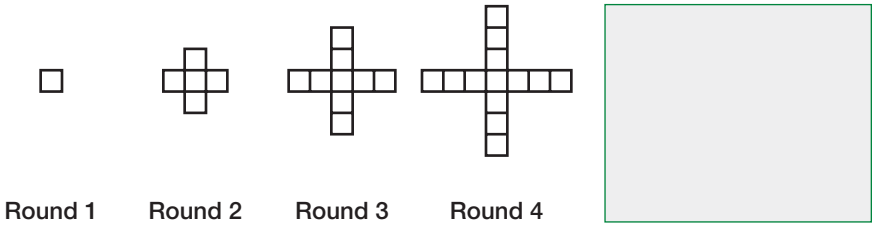
SOLVE

Garden	1	2	3	4
Surrounding Tiles	10	12	14	16
		+2	+2	+2

For each successive garden, ☐ additional tiles are needed to surround it. The 10th garden will have 16 + 2 + 2 + 2 + 2 + 2 + 2 or ☐ tiles.

CHECK Check your answer by drawing Garden 10.

Check Your Progress **GAMES** The figures below show the number of tiles on a game board after the first 4 rounds of the game. Each round, the same number of tiles are added to the board. How many tiles will be on the board after the 12th round?



Round 1 Round 2 Round 3 Round 4

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7–3 Area of Complex Figures

MAIN IDEA
- Find the area of complex figures.

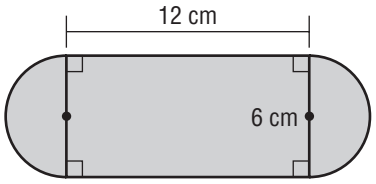
Standard 7MG2.1 Use formulas routinely for finding the perimeter and **area of basic two-dimensional figures** and the surface area and volume of basic three-dimensional figures, **including rectangles, parallelograms, trapezoids, squares, triangles, circles,** prisms, and cylinders.
Standard 7MG2.2 Estimate and **compute the area of more complex or irregular two-** and three-**dimensional figures by breaking the figures down into more basic geometric objects.**

BUILD YOUR VOCABULARY (pages 167–168)

A **complex figure** is made up of _____ shapes.

EXAMPLES Find the Areas of a Complex Figure

1 **Find the area of the complex figure. Round to the nearest tenth if necessary.**



The figure can be separated into two _____ and a _____.

Area of one semicircle

$A = \frac{1}{2}\pi r^2$

$A =$ _____

$A =$ _____

Area of triangle

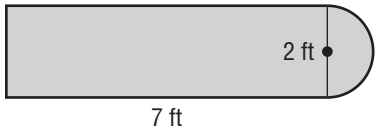
$A = \ell w$

$A =$ _____

$A =$ _____

The area of the garden is 14.1 + _____ + _____ or 100.3 square centimeters.

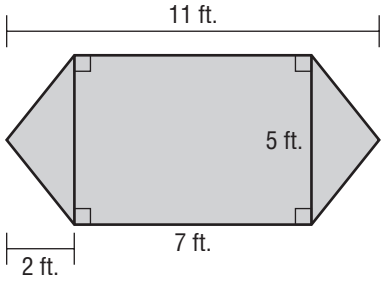
Check Your Progress Find the area of the complex figure. Round to the nearest tenth if necessary.



_____

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2 GARDENING **The dimensions of a flower garden are shown. What is the area of the garden?**



The garden can be separated into a ____ and two congruent ____.

Area of rectangle

$A = \ell w$

$A =$ ____

$A =$ ____

Area of one triangle

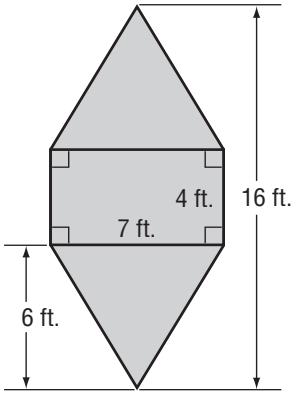
$A = \frac{1}{2}bh$

$A =$ ____

$A =$ ____

The area of the garden is ____ + ____ + ____ or ____ square feet.

Check Your Progress **GARDENING** The dimensions of a flower garden are shown. What is the area of the garden?



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7–4 Three-Dimensional Figures

Standard 7MG3.6 Identify elements of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more objects are related in space (e.g., skew lines, and the possible ways three planes might intersect).

Main Idea

- Identify and draw three-dimensional figures.

Build Your Vocabulary (pages 167–168)

A **polyhedron** is a solid with _____ surfaces that are _____.

An **edge** is where two planes _____ in a line.

A **face** is a _____ surface.

A **vertex** is where three or more planes _____ at a point.

A **prism** is a polyhedron with two _____ faces, or bases.

A **pyramid** is a polyhedron with one base that is a _____ and faces that are _____.

Key Concept

Common Polyhedrons



triangular prism



rectangular prism

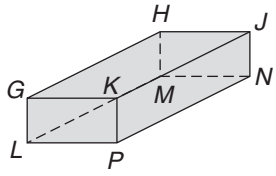


triangular pyramid



rectangular pyramid

Examples Identify Relationships



Use the figure at the right to identify the following.

1 a plane that is parallel to plane *GKJ*

Plane _____ is parallel to plane *GKJ*.

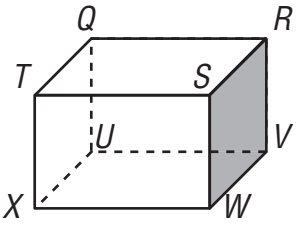
2 a segment that is skew to $\overline{JN}$

$\overline{JN}$ and _____ are skew because they do not _____ and are not coplanar.

3 two sets of points between which a diagonal can be drawn

Lines drawn between points *G* and _____ and points _____ and *J* would form diagonals.

Check Your Progress **Use the figure at the right to identify the following.**



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a. a plane that is parallel to plane $QUXT$

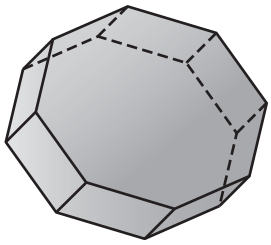
b. a segment that is skew to $\overline{XW}$

c. two sets of points between which a diagonal can be drawn

EXAMPLES **Identify Prisms and Pyramids**

Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.

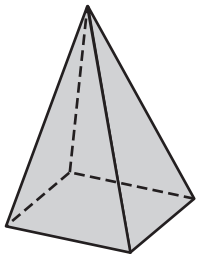
4



The figure has two parallel _____ bases that are _____, so it is an _____ prism. The other faces are rectangles.

It has a total of _____ faces, _____ edges, and _____ vertices.

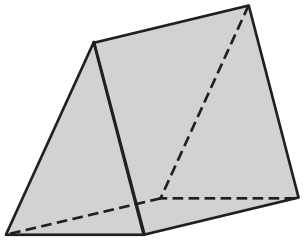
5



The figure has one base that is a _____, so it is a _____. The other faces are triangles. It has a total of _____ faces, _____ edges, and _____ vertices.

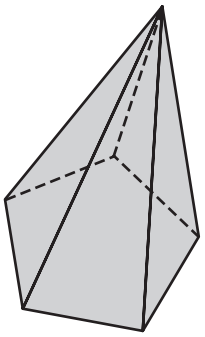
Check Your Progress **Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.**

a.



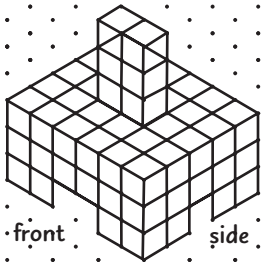
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b.

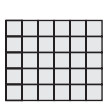


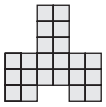
EXAMPLES Analyze Real-Life Drawings

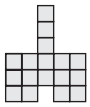
ARCHITECTURE **The plans for a hotel fireplace are shown at the right.**



6 **Draw and label the top, front, and side views.**







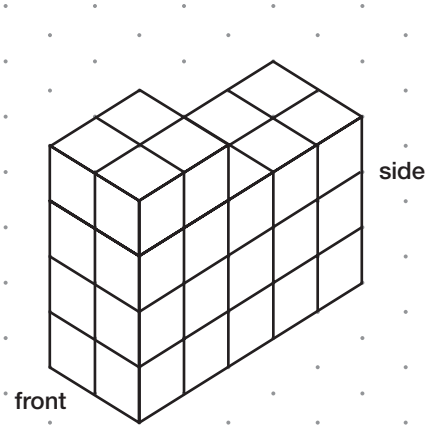
_____ view

_____ view

_____ view

Check Your Progress

The plans for a building are shown to the right. Draw and label the top, front, and side views.



HOMEWORK ASSIGNMENT

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Exercises:

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7–5 Volume of Prisms and Cylinders

MAIN IDEA
- Find the volumes of prisms and cylinders.

BUILD YOUR VOCABULARY (pages 167–168)

Volume is the measure of the _____ occupied by a solid. Volume is measured in cubic units.

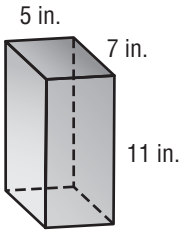
KEY CONCEPT

Volume of a Prism The volume V of a prism is the area of the base B times the height h.

Standard 7MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and **volume of basic three-dimensional figures, including** rectangles, parallelograms, trapezoids, squares, triangles, circles, **prisms, and cylinders.**
Standard 7MG2.2 Estimate and **compute the area of more complex** or irregular two- and **three-dimensional figures by breaking the figures down into more basic geometric objects.**

EXAMPLE **Find the Volume of a Rectangular Prism**

1 **Find the volume of the rectangular prism.**



$V = Bh$ Volume of a prism

$V = \left(\square\right)h$ The base is a rectangle, so $B =$ _____.

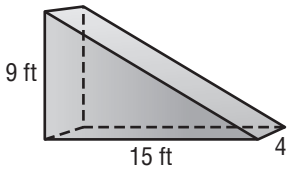
$V = (5 \cdot 7)11$ $\ell = 5$, $w = 7$, $h = 11$

$V =$ _____ Simplify.

The volume is 385 _____ inches.

EXAMPLE **Find the Volume of a Triangular Prism**

2 **Find the volume of the triangular prism.**



$V = Bh$ Volume of a prism

$V = \left(\frac{1}{2} \cdot 9 \cdot 15\right)h$ The base is a _____, so $B = \frac{1}{2} \cdot 9 \cdot 15$.

$V = \left(\frac{1}{2} \cdot 9 \cdot 15\right)4$ The height of the prism is _____.

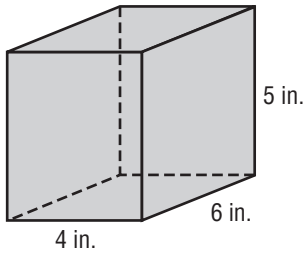
$V =$ _____ Simplify.

The volume is _____ cubic inches.

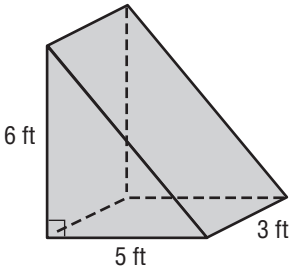
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Check Your Progress **Find the volume of each prism.**

a.



b.



BUILD YOUR VOCABULARY (pages 167–168)

A **cylinder** is a solid whose bases are congruent, parallel, ____, connected with a ____ side.

EXAMPLE 3 **Find the Volumes of Cylinders**

Find the volume of each cylinder. Round to the nearest tenth if necessary.



$V = \pi r^2 h$ Volume of a cylinder

$V = \pi \cdot$ ____$^2 \cdot$ ____ $r =$ ____, $h =$ ____

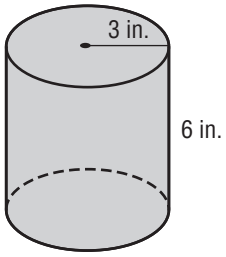
$V \approx$ ____ Simplify.

The volume is about 339.3 ____ centimeters.

KEY CONCEPT

Volume of a Cylinder The volume V of a cylinder with radius r is the area of the base B times the height h.

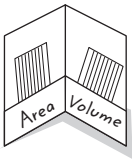
Check Your Progress Find the volume of the cylinder. Round to the nearest tenth if necessary.



FOLDABLES

ORGANIZE IT

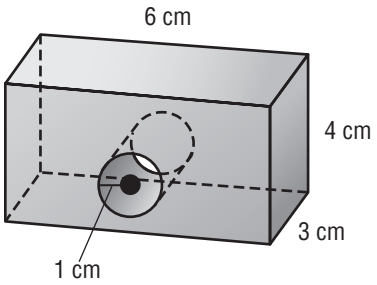
On index cards, write the formula for the volume of a rectangular prism, a triangular prism, and a cylinder. Sketch each figure and label its parts. Place your cards in the "Volume" pocket of your Foldable.



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EXAMPLE **Find the Volume of a Complex Solid**

4 **TOYS** **A wooden block has a single hole drilled entirely though it. What is the volume of the block? Round to the nearest hundredth.**



The block is a rectangular prism with a cylindrical hole.

To find the volume of the block, _____ the volume of the _____ from the volume of the _____.

Rectangular Prism

$V =$ _____

$V = (6 \cdot 3)4$ or 72

Cylinder

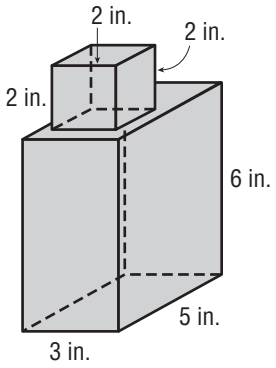
$V =$ _____

$V = \pi(1)^2(3)$ or 9.42

The volume of the box is about _____ – _____ or _____ cubic centimeters.

Check Your Progress

A small wooden cube has been glued to a larger wooden block for a whittling project. What is the volume of the wood to be whittled?



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Exercises:

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7–6 Volume of Pyramids and Cones

Standard 7MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic **three-dimensional figures, including** rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.

MAIN IDEA

- Find the volumes of pyramids and cones.

KEY CONCEPT

Volume of a Pyramid
The volume V of a pyramid is one-third the area of the base B times the height h.

EXAMPLE **Find the Volume of the Pyramid.**

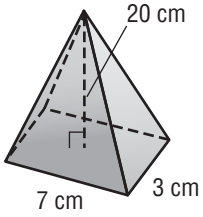
1 **Find the volume of the pyramid.**

$V = \frac{1}{3}Bh$ Volume of a pyramid

$V = \frac{1}{3}\left(\square \cdot \square\right)\square$ $B = \square \cdot \square$,

$h = \square$

$V = 140$ Simplify.

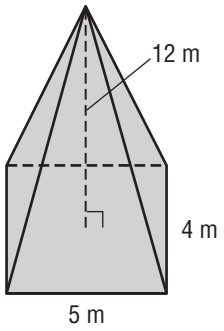


The volume is $\square$.

Check Your Progress

Find the volume of the pyramid.

$\square$



EXAMPLE **Use Volume to Solve a Problem**

2 **SOUVENIRS** **A novelty souvenir company wants to make snow "globes" shaped like pyramids. It decides that the most cost-effective maximum volume of water for the pyramids is 12 cubic inches. If a pyramid globe measures 4 inches in height, find the area of its base.**

$V = \frac{1}{3}Bh$ Volume of a pyramid

$\square = \frac{1}{3} \cdot B \cdot 4$ Replace V with $\square$ and h with $\square$.

$12 = \frac{4}{3} \cdot B$ Simplify.

$\square \cdot 12 = \square \cdot \frac{4}{3} \cdot B$ Multiply each side by $\square$.

$\square = B$

The area of the base of the snow globe is $\square$.

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Check Your Progress A company is designing pyramid shaped building blocks with a square base. They want the volume of the blocks to be 18 cubic inches. If the length of the side of the base is 3 inches, what should be the height of the blocks?

KEY CONCEPT

Volume of a Cone
The volume V of a cone with radius r is one-third the area of the base B times the height h.

BUILD YOUR VOCABULARY (pages 167–168)

A **cone** is a three-dimensional figure with one _____ base. A curved surface connects the base and the _____.

EXAMPLE **Find the Volume of a Cone**

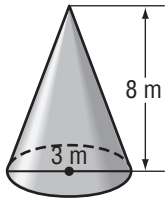
3 **Find the volume of the cone. Round to the nearest tenth.**

$V = \frac{1}{3}\pi r^2 h$ Volume of a cone

$V = \frac{1}{3} \cdot \pi \cdot$ _____$^2 \cdot$ _____ Replace r with _____

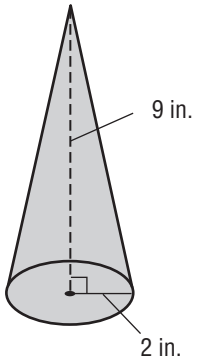
and h with _____.

$V \approx$ _____ Simplify.



The volume is _____.

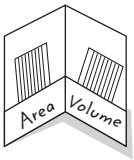
Check Your Progress Find the volume of the cone. Round to the nearest tenth.



FOLDABLES

ORGANIZE IT

On index cards, write the formula for the volume of a pyramid and a cone. Sketch each figure and label its parts. Place your cards in the "Volume" pocket of your Foldable.



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7–7 Surface Area of Prisms and Cylinders

MAIN IDEA
- Find the surface areas of prisms and cylinders.

BUILD YOUR VOCABULARY (pages 167–168)

The **surface area** of a solid is the _____ of the _____ of all its _____, or faces.

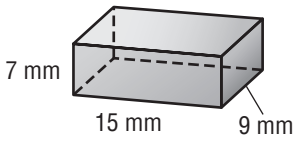
KEY CONCEPT

Surface Area of a Rectangular Prism The surface area S of a rectangular prism with length ℓ, width w, and height h is the sum of the areas of the faces.

Standard 7MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and **the surface area** and volume of basic **three-dimensional figures, including** rectangles, parallelograms, trapezoids, squares, triangles, circles, **prisms, and cylinders. Standard 7MG3.5 Construct two-dimensional patterns for three-dimensional models, such as cylinders, prisms,** and cones.

EXAMPLE 1 **Surface Area of a Rectangular Prism**

Find the lateral and total surface area of the rectangular prism.



Perimeter of Base

$P = 2\ell + 2w$

$P = 2$ _____ $+ 2$ _____ or _____

Area of Base

$B = \ell w$

$B =$ _____ $\cdot$ _____ or _____

Use this information to find the lateral and total surface area.

Lateral Surface Area

$L = Ph$

$L = 48$ _____ or _____

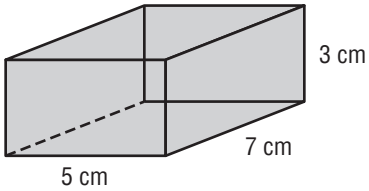
Total Surface Area

$S = L + 2B$

$S =$ _____ $+ 2 \cdot$ _____ or _____

The lateral surface area is _____, and the total surface area is _____.

Check Your Progress Find the total surface area of the rectangular prism.



_____

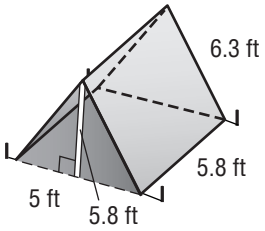
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REVIEW IT

What is the formula for finding the area of a triangle? How does this relate to finding the surface area of a triangular prism? *(Lesson 7-1)*

EXAMPLE 2 Surface Area of a Triangular Prism

CAMPING A family wants to reinforce the fabric of their tent with a waterproofing treatment. Find the total surface area, including the floor, of the tent below.



A triangular prism consists of two congruent _____ faces and three _____ faces.

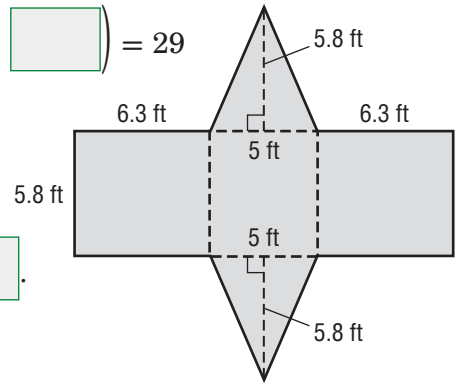
Draw and label a net of this prism. Find the area of each face.

bottom _____ · _____ = 29

left side _____ · _____ = 36.54

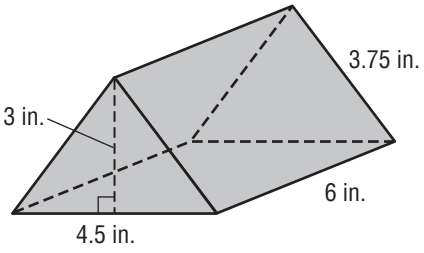
right side _____ · _____ = 36.54

two bases $2\left(\frac{1}{2} \cdot 5 \cdot \text{_____}\right) = 29$



The surface area of the tent is 29 + 36.54 + 36.54 + 29 or about _____.

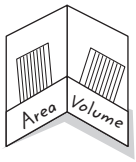
Check Your Progress Julia is painting triangular prisms to use as decoration in her garden. Find the surface area of the prism.



FOLDABLES™

ORGANIZE IT

On index cards, write these formulas for finding surface area. Then sketch and label each figure. Place the cards in the "Area" pocket of your Foldable.



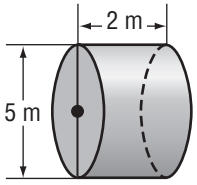
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KEY CONCEPT

Surface Area of a Cylinder The surface area S of a cylinder with height h and radius r is the area of the two bases plus the area of the curved surface.

EXAMPLE 3 Surface Area of a Cylinder

Find the lateral area and the surface area of the cylinder. Round to the nearest tenth.



Lateral Surface Area

$L = 2\pi rh$

$L = 2\pi$ ☐

$L =$ ☐

Total Surface Area

$S = L + 2\pi r^2$

$S \approx$ ☐ $+ 2\pi$ ☐

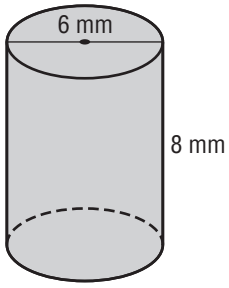
$S \approx$ ☐

The lateral surface area is about ☐,

and the total surface area is about ☐.

Check Your Progress Find the total surface area of the cylinder. Round to the nearest tenth.

☐



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7–8

Surface Area of Pyramids

Standard 7MG2.1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume **of basic three-dimensional figures,** including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.

MAIN IDEA

- Find the surface areas of pyramids and cones.

BUILD YOUR VOCABULARY (pages 167–168)

The _____ of a pyramid are called **lateral faces.**

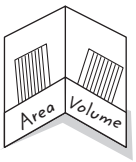
The altitude or _____ of each _____ is called the **slant height.**

The sum of the _____ of the _____ is the **lateral area.**

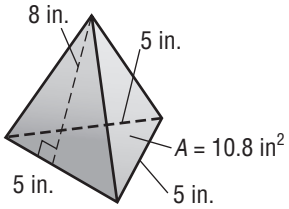
FOLDABLES

ORGANIZE IT

On a card, write the formula for finding the surface area of a pyramid. Then sketch a pyramid and label the parts. Place the card in the "Area" pocket of your Foldable.



EXAMPLE **Surface Area of a Pyramid**



1 **Find the lateral and total surface areas of the triangular pyramid.**

Find the lateral area and the area of the base.

Area of each lateral face

$A =$ _____ Area of a triangle

$A = \frac{1}{2}($_____$)($_____$)$ or _____ Replace b with _____ and h with _____.

There are 3 faces, so the lateral area is $3($_____$)$ or _____ square inches.

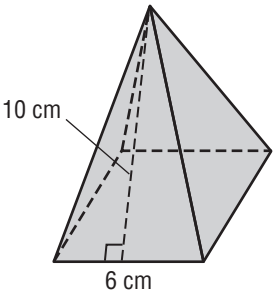
Area of base

$A =$ _____

The total surface area of the pyramid is _____ + _____ or _____ square inches.

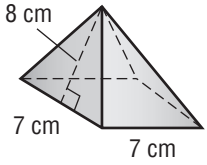
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Check Your Progress Find the total surface area of the square pyramid.



EXAMPLE

2 TOYS **A toy block has the shape of a regular pyramid with a square base. The manufacturer wants to paint the lateral surface green. How many square centimeters will be painted green?**



$L = \frac{1}{2}P\ell$ Lateral surface area of a pyramid

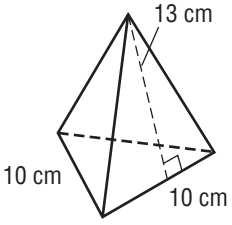
$L = \frac{1}{2}$ ____ $P =$ ____ and $\ell = 8$

$L =$ ____ Simplify.

The lateral surface area is ____.

Check Your Progress

TOYS A toy block has the shape of a regular pyramid with a square base. The manufacturer wants to paint the lateral surface green. How many square centimeters will be painted green?



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7–9 Similar Solids

Main Idea

- Find dimensions, surface area, and volume of similar solids.

Key Concept

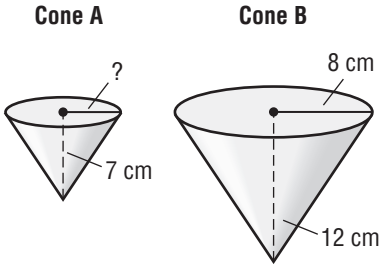
If the scale factor of the linear measures of two similar solids is $\frac{a}{b}$, then the scale factor of their surface areas is $\left(\frac{a}{b}\right)^2$ and the scale factor of their volumes is $\left(\frac{a}{b}\right)^3$.

Standard 7MG2.3 **Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.**

EXAMPLE Find Missing Linear Measures

1 **These cones are similar. What is the radius of Cone A to the nearest tenth?**

Since the two cones are similar, the ratios of their corresponding linear measures are proportional.



Words $\frac{\text{radius cone A}}{\text{radius cone B}}$ is proportional to $\frac{\text{height cone A}}{\text{height cone B}}$

Variable Let r represent the radius of cone A.

Equation $\frac{\square}{\square} = \frac{\square}{\square}$

$\frac{\square}{\square} = \frac{\square}{\square}$ Write the proportion.

$r \cdot 12 = \square$ Find the cross products.

$12r = 56$ Multiply.

$\frac{12r}{\square} = \frac{56}{\square}$ Divide each side by $\square$.

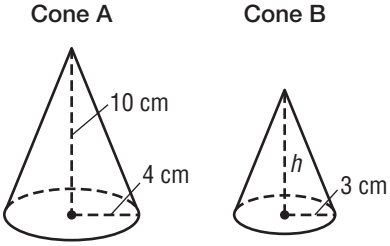
$r \approx \square$ Simplify.

The radius of cone A is about $\square$.

Check Your Progress

These cones are similar. What is the height of Cone B to the nearest tenth?

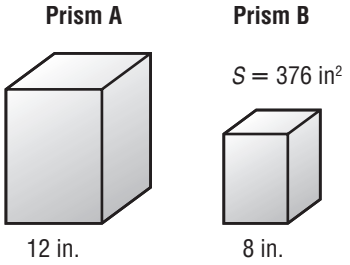
$\square$



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EXAMPLE **Find Surface Area of a Similar Solid**

2 **These rectangular prisms are similar. Find the total surface area of Prism A.**



The ratio of the measures of Prism A to Prism B is $\frac{12}{8}$ or $\frac{3}{2}$.

$\frac{\text{surface area of prism A}}{\text{surface area of prism B}} = \left(\frac{a}{b}\right)^2$ Write a proportion.

$\square = \square$ Substitute the known values.

$\square = \square$ Simplify.

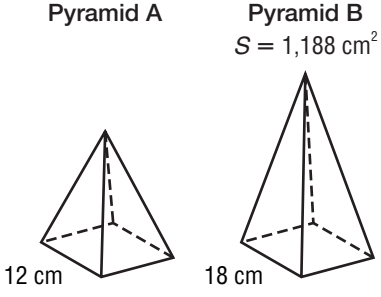
$\square \cdot \square = \square \cdot \square$ Find the cross products.

$\square = \square$ Divide each side by $\square$.

$S = \square$ Simplify.

The surface area of Prism A is $\square$.

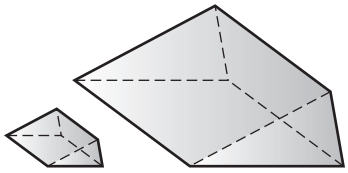
Check Your Progress These square pyramids are similar. Find the total surface area of Prism A.



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EXAMPLE

3 STANDARDS EXAMPLE **A triangular prism has a volume of 12 cubic centimeters. Suppose the dimensions are tripled. What is the volume of the new prism?**



A 36 cm^3 **C** 324 cm^3

B 96 cm^3 **D** 1,728 cm^3

Read the Test Item

You know that the prisms are similar, the ratio of the side lengths ☐ is ☐, and the volume of the smaller prism is 12 cubic centimeters.

Solve the Test Item

Since the volumes of similar solids have a ratio of $\left(\frac{a}{b}\right)^3$ and $\frac{a}{b} = 13$, replace a with ☐ and b with ☐ in $\left(\frac{a}{b}\right)^3$.

$\frac{\text{volume of smaller prism}}{\text{volume of larger prism}} = \left(\frac{a}{b}\right)^3$ Write a proportion.

$\square = \left(\frac{1}{3}\right)^3$ Substitute known values.

$\square \cdot \square = \square \cdot \square$ Find the cross products.

$\square = V$ Simplify.

So, the volume of the larger prism is ☐. The answer is ☐.

Check Your Progress **STANDARDS EXAMPLE** A hexagonal prism has a volume of 25 cubic inches. Suppose the dimensions are tripled. What is the volume of the new prism?

A 75 $in.^3$ **C** 200 $in.^3$

B 120 $in.^3$ **D** 675 $in.^3$

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CHAPTER 7

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 7 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 7, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 167–168*) to help you solve the puzzle.

7-1

Circumference and Area of Circles

Complete.

1. The distance from the center of a circle to any point on the circle is called the _____, while the distance around the circle is called the _____.

Find the circumference and area of each circle. Round to the nearest tenth.

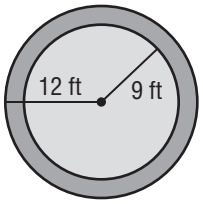
2. The radius is 14 miles.

3. The diameter is 17.4 in^2.

7-2

Problem-Solving Investigation: Solve a Simpler Problem

4. **LANDSCAPING** Laura is helping her father make a circular walkway around a flower bed as shown. What is the area, in square feet, of the walkway?



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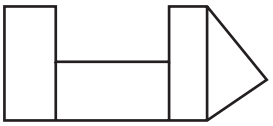
7-3

Area of Complex Figures

5. What is a complex figure?

6. What is the first step in finding the area of a complex figure?

7. Explain how to divide up the figure shown.



7-4

Three-Dimensional Figures

Match each description with the word it describes.

8. a flat surface

9. a polyhedron with one base that is a polygon and faces that are triangles

10. where three or more planes intersect at a point

11. where two planes intersect in a line

12. a polyhedron with two parallel, congruent faces

a. vertex
b. edge
c. face
d. base
e. prism
f. pyramid

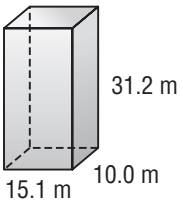
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7-5

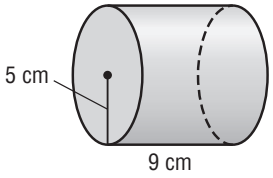
Volume of Prisms and Cylinders

Find the volume of each solid. Round to the nearest tenth if necessary.

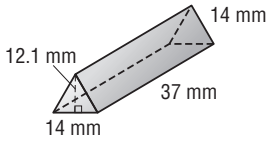
13.



14.



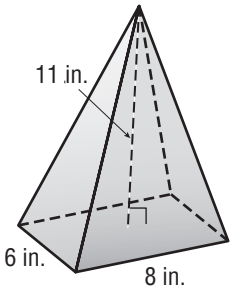
15.



7-6

Volume of Pyramids and Cones

16. Fill in the table about what you know from the diagram. Then complete the volume of the pyramid.



length of rectangle	
width of rectangle	
area of base	
height of pyramid	
volume of pyramid	

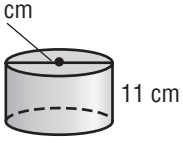
7-7

Surface Area of Prisms and Cylinders

17. Complete the sentence with the correct numbers. When you draw a net of a triangular prism, there are ____ congruent triangular faces and ____ rectangular faces.

18. If you unroll a cylinder, what does the net look like?

19. Find the surface area of the cylinder. Round the nearest tenth.



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7-8

Surface Area of Pyramids and Cones

20. Complete the steps in finding the surface area of a square pyramid.

Area of each lateral face

$A = \frac{1}{2}bh$ ____

$A = \frac{1}{2}(9)(16)$ ____

$A = 72$ ____

There are ____ faces, so the lateral area is $4(72) =$ ____ square inches.

Area of base

$A = s^2$ ____

$A = 9^2$ or 81 ____

The surface area of the square pyramid is ____ + ____ or ____ square inches.

21. What two areas are needed to calculate the surface area of a cone?

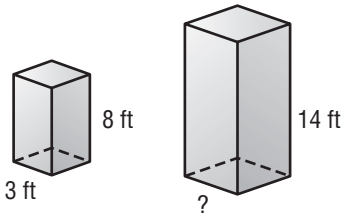
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7-9

Similar Solids

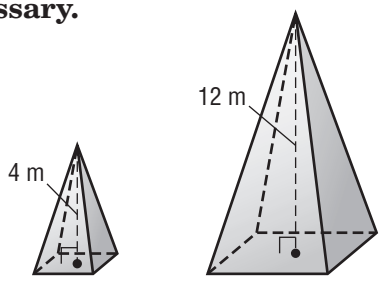
Find the missing measure for each pair of similar solids. Round to the nearest tenth if necessary.

22.



____

23.



____

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CHAPTER 7 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 7.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 7 Practice Test on page 409 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 7 Study Guide and Review on pages 405–408 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 7 Practice Test on page 409.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 7 Foldable.
- Then complete the Chapter 7 Study Guide and Review on pages 405–408 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 7 Practice Test on page 409.

Student Signature

Parent/Guardian Signature

Teacher Signature

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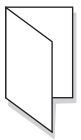
CHAPTER 8

Algebra: More Equations and Inequalities

FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain sheet of 11" × 17" paper.

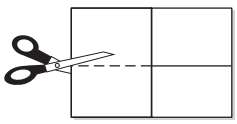
STEP 1 **Fold** in half lengthwise.



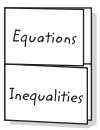
STEP 2 **Fold** again from top to bottom.



STEP 3 **Open** and cut along the second fold top make two tabs.



STEP 4 **Label** each tab as shown.



NOTE-TAKING TIP: When you take notes, define new terms and write about the new concepts you are learning in your own words. Write your own examples that use the new terms and concepts.

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CHAPTER 8

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 8. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
coefficient			
constant			
equivalent expressions			
like terms			
simplest form			
simplifying the expression			
term			
two-step equation			

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8–1 Simplifying Algebraic Expressions

MAIN IDEA

- Use the Distributive Property to simplify algebraic expressions.

Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*. **Standard 7AF1.3 Simplify numerical expressions by applying properties of rational numbers (e.g.,** identity, inverse, **distributive,** associative, commutative**) and justify the process used. Standard 7AF1.4 Use algebraic terminology (e.g.** variable, equation, **term, coefficient,** inequality, expression, **constant)** correctly.

REVIEW IT

What is the sign of the product when you multiply two integers with different signs? with the same sign? *(Lesson 1-6)*

BUILD YOUR VOCABULARY (page 196)

Equivalent expressions are expressions that have the _____ regardless of the value of the variable.

EXAMPLE **Write Equivalent Expressions**

1 **Use the Distributive Property to rewrite $3(x + 5)$.**

$3(x + 5) = 3(x) + 3(5)$

$= 3x +$ ☐ Simplify.

Check Your Progress **Use the Distributive Property to rewrite each expression.**

a. $2(x + 6)$

b. $(a + 6)3$

EXAMPLES **Write Expressions with Subtraction**

Use the Distributive Property to rewrite each expression.

2 **$(q - 3)9$**

$(q - 3)9 = [q + (-3)]9$ Rewrite $q - 3$ as $q + (-3)$

$= (\square)9 + (\square)9$ Distributive Property.

$= \square + (\square)$ Simplify.

$= \square - \square$ Definition of subtraction.

3 **$-3(z - 7)$**

$-3(z - 7) = -3[z + (-7)]$ Rewrite $z - 7$ as $z + (-7.)$

$= -3(z) + (-3)(-7)$ Distributive Property

$= -3z +$ ☐ Simplify.

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Check Your Progress **Use the Distributive Property to rewrite each expression.**

a. $(q - 2)8$

b. $-2(z - 4)$

BUILD YOUR VOCABULARY (page 196)

When a plus sign separates an algebraic expression into parts, each part is called a **term.**

The numeric factor of a term that contains a [ ] is called the **coefficient** of the variable.

Like terms are terms that contain the [ ] variable.

A term without a [ ] is called a **constant.**

EXAMPLE **Identify Parts of an Expression**

4 **Identify the terms, like terms, coefficients, and constants in $3x - 5 + 2x - x$.**

$3x - 5 + 2x - x$

$= 3x + \left(\ \right) + 2x + \left(\ \right)$ Definition of Subtraction

$= 3x + (-5) + 2x + (-1x)$ Identity Property; $-x = -1x$

The terms are $3x$, [ ], $2x$, and $-x$. The like terms are $3x$, $2x$, and [ ]. The coefficients are 3, [ ], and -1. The constant is [ ].

Check Your Progress Identify the terms, like terms, coefficients, and constants in $6x - 2 + x - 4x$.

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BUILD YOUR VOCABULARY (page 196)

An algebraic expression is in **simplest form** if it has no _____ and no _____.

When you use properties to _____ like terms, you are **simplifying the expression.**

EXAMPLES Simplify Algebraic Expressions

Simplify each expression.

5 $6n - n$

$6n$ and n are _____ terms.

$6n - n = 6n -$ _____ Identity Property; $n =$ _____

$= (6 - 1)n$ Distributive Property

$=$ _____ Simplify.

6 $8z + z - 5 = 9z + 2$

$8z$, z, and _____ are like terms. 25 and _____ are also like terms.

$8z + z - 5 - 9z + 2$

$= 8z + z +$ (_____) $+$ (_____) $+ 2$ Definition of subtraction.

$= 8z + z + (-9z) + (-5) + 2$ Commutative Property

$= [8 + 1 + (-9)]$_____ $+ [(-5) + 2]$ Distributive Property

$= 0z +$ _____ Simplify.

$=$ _____

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

Check Your Progress

Simplify each expression.

a. $7n + n$

b. $6s + 2 - 10s$

c. $6z + z - 2 - 8z + 2$

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8–2 Solving Two-Step Equations

Standard 7AF4.1 Solve two-step linear equations and inequalities **in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.**

MAIN IDEA

- Solve two-step equations.

BUILD YOUR VOCABULARY (page 196)

A **two-step equation** contains ____.

REMEMBER IT

Two-step equations can also be solved using models. Refer to page 534 of your textbook.

EXAMPLES **Solve Two-Step Equations**

1 **Solve $5y + 1 = 26$.**

Use the Subtraction Property of Equality.

$5y + 1 = 26$ Write the equation.

$\square - \square$ Subtract $\square$ from each side.

$5y \quad = 25$

Use the Division Property of Equality.

$5y = 25$

$\frac{5y}{\square} = \frac{25}{\square}$ Divide each side by $\square$.

$y = \square$ Simplify.

2 **Solve $-4 = \frac{1}{3}z + 2$.**

$-4 = \frac{1}{3}z + 2$ Write the equation.

$-4 - \square = \frac{1}{3}z + 2 - \square$ Subtract $\square$ from each side.

$\square = \frac{1}{3}z$ Simplify.

$\square(-6) = \square \cdot \frac{1}{3}z$ Multiply each side by $\square$.

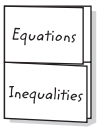
$\square = z$ Simplify.

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FOLDABLES

ORGANIZE IT

Under the "Equations" tab, include examples of how to solve a two step equation. You can use your notes later to tell someone else what you learned in this lesson.



Check Your Progress **Solve each equation.**

a. $3x + 2 = 20$

b. $-5 = \frac{1}{2}z + 8$

EXAMPLE **Equations with Negative Coefficients**

3 **Solve $8 - 3x = 14$.**

$8 - 3x = 14$	Write the equation.
$8 + (\square) = 14$	Definition of subtraction.
$8 - 8 + (\square) = 14 - 8$	Subtract 8 from each side.
$-3x = 6$	Simplify.
$\frac{-3x}{\square} = \frac{6}{\square}$	Divide each side by $\square$.
$x = -2$	Simplify

REMEMBER IT

When you are solving an equation, watch for the negative signs. In Example 3, the coefficient of the variable, x, is -3, not $+3$. So, divide each side by -3 to solve for x.

Check Your Progress Solve $5 - 2x = 11$.

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REVIEW IT

Simplify $-c + 4c$.

EXAMPLE **Combine Like Terms First**

4 **Solve $14 = -k + 3k - 2$.**

$14 = -k + 3k - 2$	Write the equation.
$14 = -1k + 3k - 2$	☐ Property; $-k = 1k$
$14 = \square - 2$	Combine like terms; $-1k + 3k = (-1 + 3)k$ or $2k$.
$14 + \square = 2k - 2 + \square$	Add ☐ to each side.
$16 = 2k$	Simplify.
$\frac{16}{\square} = \frac{2k}{\square}$	Divide each side by ☐.
$8 = k$	Simplify.

Check Your Progress Solve $10 = -n + 4n - 5$.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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8–3 Writing Two-Step Equations

Standard 7AF1.1 Use variables and appropriate operations to write an expression, **an equation,** an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.

MAIN IDEA

- Write two-step equations that represent real-life situations.

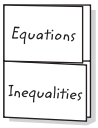
REVIEW IT

What are at least two words that will tell you that a sentence can be written as an equation? *(Lesson 1-7)*

FOLDABLES

ORGANIZE IT

Record the main ideas, definitions of vocabulary words, and other notes as you learn how to write two-step equations. Write your notes under the "Equations" tab.



EXAMPLES Translate Sentences Into Equations

Translate each sentence into an equation.

	Sentence	Equation
1	Three more than half a number is 15.	$\frac{1}{2}n + \square = 15$
2	Nineteen is two more than five times a number.	$19 = \square + 2$
3	Eight less that twice a number is −35.	$\square - 8 = -35$

EXAMPLE Write and Solve a Two-Step Equation

4 **TRANSPORTATION A taxi ride costs $3.50 plus $2 for each mile traveled. If Jan pays $11.50 for the ride, how many miles did she travel?**

Words $3.50 plus $2 per mile equals $11.50.

Variables Let m represent the miles driven.

Equation $3.50 + 2m = 11.50$

$\square + \square = 11.50$ Write the equation.

$3.50 - \square + 2m = 11.50 - \square$ Subtract $\square$ from each side.

$2m = 8$ Simplify.

$\frac{\square}{\square} = \frac{\square}{\square}$ Divide each side by $\square$.

$m = \square$ Simplify.

Jan traveled $\square$ miles.

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Check Your Progress **Translate each sentence into an equation.**

a. Five more than one third a number is 7.

b. Fifteen is three more than six times a number.

c. Six less that three times a number is −22.

d. A rental car costs \$100 plus \$0.25 for each mile traveled. If Kaya pays \$162.50 for the car, how many miles did she travel?

EXAMPLE

5 **DINING** **You and your friend spent a total of \$33 for dinner. Your dinner cost \$5 less than your friend's. How much did you spend for dinner?**

Words Your friend's dinner plus your dinner equals \$33.

Variables Let f represent the cost of your friend's dinner.

Equation $f + f - 5 = 33$

$\square = 33$ Write the equation.

$\square - 5 = 33$ Combine like terms.

$2f - 5 + 5 = 33 + 5$ Add 5 to both sides.

$2f = \square$ Simplify.

(continued on the next page)

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$\square = \square$ Divide each side by $\square$.

$f = \square$ Simplify.

Your friend spent $\square$ on dinner. So you spent $\square$ on dinner.

Check Your Progress **DINING** You and your friend spent a total of $48 for dinner. Your dinner cost $4 more than your friend's. How much did you spend for dinner?

HOMEWORK ASSIGNMENT

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8–4 Solving Equations with Variables on Each Side

MAIN IDEA

- Solve equations with variables on each side.

EXAMPLE 1 Equations with Variables on Each Side

Solve $7x + 4 = 9x$.

$7x + 4 = 9x$ — Write the equation.

$7x - \square + 4 = 9x - \square$ — Subtract $\square$ from each side.

$\square = \square$ — Simplify by combining like terms.

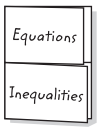
$\square = \square$ — Divide each side by $\square$.

Check Your Progress Solve $3x + 6 = x$.

FOLDABLES

ORGANIZE IT

Describe in your own words the steps to follow when you solve an equation with variables on both sides. Write an example of such an equation and solve it.



Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.

Standard 7AF4.1 Solve two-step linear equations and inequalities **in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.**

EXAMPLE 2 Equations with Variables on Each Side

Solve $3x - 2 = 8x + 13$.

$3x - 2 = 8x + 13$ — Write the equation.

$3x - \square - 2 = 8x - \square + 13$ — Subtract $\square$ from each side.

$-5x - 2 = 13$ — Simplify.

$-5x - 2 + \square = 13 + \square$ — Add $\square$ to each side.

$\square = \square$ — Simplify.

$x = \square$ — Divide each side by $\square$.

Check Your Progress Solve $4x - 3 = 5x + 7$.

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EXAMPLE

3 **GEOMETRY** **The measure of an angle is 8 degrees more than its complement. If x represents the measure of the angle and $90 - x$ represents the measure of its complement, what is the measure of the angle?**

Words → **Variables** → **Equation**

8 less than the measure of an angle equals the measure of its complement

Let x and $90 - x$ represent the measures of the angles

$x - 8 = 90 - x$

$\square = \square$	Write the equation.
$x - 8 \square = 90 \square - x$	Add $\square$ to each side.
$x = 98 - x$	Simplify.
$x + \square = 98 - x \square$	Add $\square$ to each side.
$\square = 98$	Simplify.
$\square = \square$	Divide each side by $\square$.
$x = \square$	Simplify.

The measure of the angle is $\square$.

Check Your Progress **GEOMETRY** The measure of an angle is 12 degrees less than its complement. If x represents the measure of the angle and $90 - x$ represents the measure of its complement, what is the measure of the angle?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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8–5 Problem-Solving Investigation: Guess and Check

MAIN IDEA

- Solve problems by guessing and checking.

Standard 7MR2.8 Make precise calculations and check the validity of the results from the context of the problem.
Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g. three less than a number, half as large as area *A*.

EXAMPLE

THEATER 120 tickets were sold for the school play. Adult tickets cost $8 each and child tickets cost $5 each. The total earned from ticket sales was $840. How many tickets of each type were sold?

EXPLORE You know the cost of each type of ticket, the total number of tickets sold, and the total income from ticket sales.

PLAN Use a systematic guess and check method to find the number of each type of ticket.

SOLVE Find the combination that gives 120 total tickets and $840 in sales. In the list, a represents adult tickets sold, and *c* represents child tickets sold.

a	*c*	$8a + 5c$	Check
50	70	$8(50) + 5(70) = 750$	too low
60		$8(60) +$ ☐ $=$ ☐	

CHECK So ☐ adult tickets and ☐ child tickets were sold.

Check Your Progress **THEATER** 150 tickets were sold for the school play. Adult tickets were sold for $7.50 each, and child tickets were sold for $4 each. The total earned from ticket sales was $915. How many tickets of each type were sold?

HOMEWORK ASSIGNMENT

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Exercises:

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8–6 Inequalities

Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, **an inequality,** or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.

MAIN IDEA
- Write and graph inequalities.

EXAMPLES Write Inequalities with < or >.

Write an inequality for each sentence.

1 SPORTS Members of the little league team must be under 14 years old.

Let a = person's age.

a ☐ 14

2 CONSTRUCTION The ladder must be over 30 feet tall to reach the top of the building.

Let h = ladder's height.

h ☐ 30

Check Your Progress **Write an inequality for each sentence.**

a. Members of the peewee football team must be under 10 years old.

b. The new building must be over 300 feet tall.

EXAMPLES Write Inequalities with ≤ or ≥

Write an equality for each sentence.

3 POLITICS The president of the United States must be at least 35 years old.

Let a = president's age.

a ☐ 35

4 CAPACITY A theater can hold a maximum of 300 people.

Let p = theater's capacity.

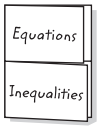
p ☐ 300

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FOLDABLES™

ORGANIZE IT

Record the main ideas about how to write inequalities. Include examples to help you remember. Write your notes under the "Inequalities" tab.



Check Your Progress **Write an inequality for each sentence.**

a. To vote, you must be at least 18 years old.

b. A football stadium can hold a maximum of 10,000 people.

EXAMPLES **Determine the Truth of an Inequality**

For the given value, state whether the inequality is *true* or *false*.

5 $x - 4 < 6, x = 0$

$x - 4 < 6$ Write the inequality.

$\square - 4 \stackrel{?}{<} 6$ Replace x with $\square$.

$\square < 6$ Simplify.

Since $\square$ is less than $\square$, $\square < \square$ is $\square$.

6 $3x \geq 4, x = 1$

$3x \geq 4$ Write the inequality.

$3\square \stackrel{?}{\geq} 4$ Replace x with 1.

$\square \ngeq 4$ Simplify.

Since $\square$ is not greater than or equal to 4, the sentence is $\square$.

WRITE IT

Write in words what the symbols <, >, ≤, and ≥ mean.

Check Your Progress **For the given value, state whether the inequality is *true* or *false*.**

a. $x - 5 < 8, x = 16$

b. $2x \geq 9, x = 5$

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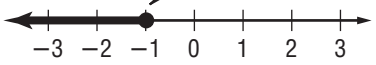
EXAMPLES Graph an Inequality

Graph each inequality on a number line.

7 $n \leq -1$

Place a [ ] circle at -1. Then draw a line and an arrow to the [ ].

The closed circle means the number -1 is included in the graph.



8 $n > -1$

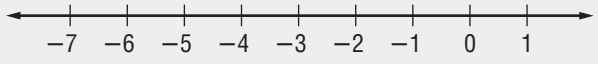
Place an [ ] circle at -1. Then draw a line and an arrow to the [ ].

The open circle means -1 is *not* included in the graph.

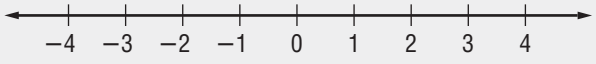


Check Your Progress **Graph each inequality on a number line.**

a. $n \leq -3$



b. $n > -3$



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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8–7 Solving Inequalities by Adding or Subtracting

MAIN IDEA

- Solve inequalities by using the Addition or Subtraction Properties of Inequality.

Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, **an inequality,** or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.
Standard 7AF4.1 Solve two-step **linear** equations and **inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.**

EXAMPLES Solving Inequalities

1 **Solve $-21 \geq d - 8$.**

$-21 \geq d - 8$ Write the inequality.

$-21 +$ ☐ $\geq d - 8 +$ ☐ Add ☐ to each side.

☐ $\geq d$ or $d \leq$ ☐ Simplify.

2 **Solve $y + 5 > 11$.**

$y + 5 > 11$ Write the inequality.

$y + 5 -$ ☐ $> 11 -$ ☐ Subtract ☐ from each side.

$y >$ ☐ Simplify.

Check Your Progress **Solve each inequality.**

a. $x - 7 < 3$

b. $-6 \geq z + 10$

EXAMPLE

3 **STANDARDS EXAMPLE** **Kayta took $12 to the bowling alley. Shoe rental costs $3.75. What is the most he could spend on games and snacks?**

Read the Test Item

Since we want to find the most he could spend, use less than or equal to.

Solve the Test Item

Let $x =$ the amount Kayta could spend on games and snacks.

Estimate: $\$12 - \$4 = \$$ ☐

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shoe rental	plus	games and snacks	is less than or equal to	$12

$\$3.75 + x \leq \$12$ Write the inequality.

$\$3.75 -$ ☐ $+ x \leq \$12 -$ ☐ Subtract ☐ from each side.

$x \leq$ ☐ Simplify.

Kayta could spend no more than ☐ on games and snacks.

Check Your Progress **Monique took $20 to the bookstore. She spent $2.25 on a snack at the library café. What is the most she could spend on books?**

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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8–8 Solving Inequalities by Multiplying or Dividing

MAIN IDEA

- Solve inequalities by using the Multiplication or Division Properties of Inequality.

Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, **an inequality,** or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.
Standard AF4.1 Solve two-step **linear** equations and **inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.**

EXAMPLES Solve Inequalities by Multiplying or Dividing

1 **Solve $6x < -30$.**

$6x < -30$ Write the inequality.

$\frac{6x}{\square} < \frac{-30}{\square}$ Divide each side by $\square$.

$x < \square$ Simplify.

2 **Solve $\frac{1}{2}p \geq 9$.**

$\frac{1}{2}p \geq 9$ Write the inequality.

$\left(\square\right)\left(\frac{1}{2}p\right) \geq \left(\square\right)(9)$ Multiply each side by $\square$.

$p \geq \square$

Check Your Progress **Solve each inequality.**

a. $5n \leq 40$

$\square$

b. $\frac{1}{4}y > -5$

$\square$

EXAMPLES Multiply or Divide by a Negative Number

3 **Solve $\frac{b}{-4} \leq 5$.**

$\frac{b}{-4} \leq 5$ Write the inequality.

$\left(\square\right)\left(\frac{b}{-4}\right)\square\left(\square\right)(5)$ Multiply each side by $\square$ and reverse the symbol.

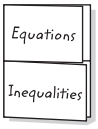
$b \geq \square$ Simplify.

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FOLDABLES™

ORGANIZE IT

Describe in your own words the steps to follow when you solve an inequality by multiplying or dividing by a negative number.



4 **Solve $-4n > -60$.**

$-4n > -60$ Write the inequality.

$\frac{-4n}{\square} < \frac{-60}{\square}$ Divide each side by $\square$ and reverse symbol.

$n < \square$ Simplify.

Check Your Progress **Solve each inequality.**

a. $\frac{x}{-3} \leq 7$ $\square$

b. $-8b < -56$ $\square$

EXAMPLE

5 **PACKAGES** **A box weighs 1 pound. It is filled with books that weigh 2 pounds each. Jesse can carry at most 20 pounds. Assuming space is not an issue, write and solve an inequality to find how many books he can put in the box and still carry it.**

The phrase *at most* means *less than or* $\square$ *to*.

WORDS 1 lb plus 2 lb per book is less than or equal to $\square$ lb.

VARIABLE Let p represent the number of $\square$ put in the box.

INEQUALITY $1 \quad \square \quad 2p \quad \leq \quad \square$

$1 + 2p \leq 20$ Write the inequality.

$1 - \square + 2p \leq 20 - \square$ Subtract $\square$ from each side.

$2p \leq \square$ Simplify.

$\frac{2p}{\square} \leq \frac{19}{\square}$ Divide each side by $\square$.

$p \leq \square$ Simplify.

Since Jesse can not put half a book in the box, Jesse can put at most $\square$ books in the box.

Check Your Progress **HAIR** Lela paid $55 for a full-hair highlight. Each partial highlight there after costs $30. Lela wants to spend no more than $150 on hair highlights this year. Write and solve an inequality to find how many highlights she can get this year.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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CHAPTER 8

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 8 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 8, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*page 196*) to help you solve the puzzle.

8-1 Simplifying Algebraic Expressions

1. Simplify the expression $3x - 4 - 8x + 2$ by writing the missing information:

[ ] and [ ] are like terms. [ ] and [ ] are also like terms.

$3x - 4 - 8x + 2 = 3x +$ [ ] $- 8x + 2$ Definition of subtraction

$=$ [ ] $+ (-4) + 2$ Commutative Property

$=$ [ ] $x + -4 + 2$ Distributive Property

$=$ [ ] Simplify.

8-2 Solving Two-Step Equations

2. Define *two-step equation.*

What is the first step in solving each equation?

3. $3y - 2 = 16$ **4.** $5 - 6x = -19$ **5.** $32 = 4b + 6 - b$

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8-3

Writing Two-Step Equations

Write each sentence as an algebraic equation.

6. Four less than six times a number is −40. ____

7. The quotient of a number and 9, decreased by 3 is equal to 24.

____

8. Jennifer bought 3 CDs, each having the same price. Her total for the purchase was $51.84, which included $3.84 in sales tax. Find the price of each CD.

Let p represent ____

Equation: Price of 3 CDs + ____ = ____

____ + ____ = 51.84

$3p + 3.84 -$ ____ $= 51.84 -$ ____

____ = ____

____ $= \frac{48}{3}$

$p =$ ____

8-4

Solving Equations with Variables on Each Side

Solve each equation.

9. $3x + 2 = 2x + 5$ ____

10. $6x - 2 = 3x$ ____

11. $7x - 2 = 9x + 6$ ____

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8-5 Problem-Solving Investigation: Guess and Check

12. PROMOTIONS A sports drink company is offering free mountain bikes to people who collect enough points by buying bottles of the drink. You earn 5 points when you buy a 20-ounce bottle, and you earn 10 points when you buy a 32-ounce bottle. To get the bike, you need to have 915 points. What is the least number of bottles of sports drink you would have to buy in order to get the bike?

13. NUMBER THEORY The product of a number and its next two consecutive whole numbers is 60. What are the numbers?

8-6 Inequalities

Write an inequality for each sentence using the symbol <, >, ≤, or ≥.

14. Children under the age of 2 fly free.

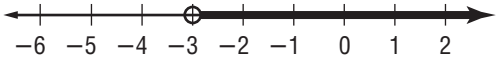
15. You must be at least 12 years old to go on the rocket ride.

Write the solution shown by each graph.

16.



17.



8-7 Solving Inequalities by Adding or Subtracting

Solve each inequality. Check your solution.

18. $8 + x > 12$

19. $n - 3 \leq -5$

20. $1 < g - 6$

8-8 Solving Inequalities by Multiplying or Dividing

Solve each inequality. Check your solution.

21. $7m \geq 77$

22. $\frac{x}{5} > -3$

23. $-12b \leq 48$

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CHAPTER 8 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 8.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 8 Practice Test on page 459 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 8 Study Guide and Review on pages 454–458 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 8 Practice Test on page 459.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 8 Foldable.
- Then complete the Chapter 8 Study Guide and Review on pages 454–458 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 8 Practice Test on page 459.

Student Signature

Parent/Guardian Signature

Teacher Signature

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CHAPTER 9

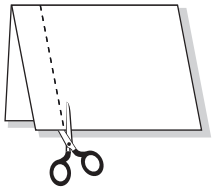
Algebra: Linear Functions

FOLDABLES™

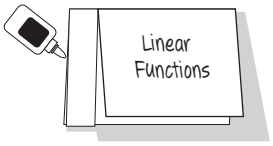
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with seven sheets of $8\frac{1}{2}$" × 11" paper.

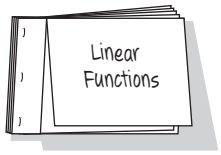
STEP 1 **Fold** a sheet of paper in half lengthwise. Cut a 1" tab along the left edge through one thickness.



STEP 2 **Glue** the 1" tab down. Write the title of the lesson on the front tab.



STEP 3 **Repeat** Steps 1–2 for the remaining sheets of paper. Staple together to form a booklet.



NOTE-TAKING TIP: When you begin studying a chapter in a textbook, first skim through the chapter to become familiar with the topics. As you skim, write questions about what you don't understand and what you'd like to know. Then, as you read the chapter, write answers to your questions.

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Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 9. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
constant of variation			
direct variation			
domain			
function			
function table			
line of fit			
linear function			

(continued on the next page)

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Vocabulary Term	Found on Page	Definition	Description or Example
range			
rise			
run			
scatter plot			
slope			
slope-intercept form			
system of equations			
system of inequalities			
y-intercept			

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9–1 Functions

Main Idea
- Complete function tables.

Preparation for Standard 7AF3.3 Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph. **Standard 7MR2.5 Use a variety of methods,** such as words, numbers, **symbols,** charts, graphs, **tables, diagrams,** and models, to explain mathematical reasoning.

Build Your Vocabulary (pages 221–222)

A _____ where one thing _____ another is called a **function**.

EXAMPLE Find a Function Value

Find each function value.

1 $f(4)$ **if** $f(x) = x - 8$

$f(x) = x - 8$ — Write the function.

$f(\square) = \square - 8$ — Substitute $\square$ for x into the function rule.

$= \square$ — Simplify.

So, $f(4) = \square$.

2 $f(-6)$ **if** $f(x) = 3x + 4$

$f(x) = 3x + 4$ — Write the function.

$f(\square) = 3(\square) + 4$ — Substitute $\square$ for x into the function rule.

$f(\square) = \square + 4$ — Multiply.

$= \square$ — Simplify.

So, $f(-6) = \square$.

Check Your Progress **Find each function value.**

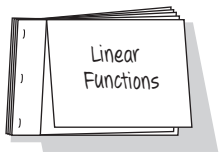
a. $f(2)$ if $f(x) = x - 7$

b. $f(-2)$ if $f(x) = 2x + 6$

FOLDABLES™

Organize It

In your Foldable, write how you would find the value of a function. You may wish to include an example.



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BUILD YOUR VOCABULARY (pages 221–222)

The variable for the _____ of a function is called the **independent variable**.

The variable for the _____ of a function is called the **dependent variable**.

The set of _____ values in a function is called the **domain**.

The set of _____ values in a function is called the **range**.

EXAMPLE **Make a Function Table**

3 **Complete the function table for $f(x) = 4x - 1$. Then state the domain and the range of the function.**

Substitute each value of x, or _____, into the function rule.

Then simplify to find the _____.

Input x	Rule $4x - 1$	Output $f(x)$
-3		
-2		
-1		
0		
1		

$f(x) = 4x - 1$

$f(-3) =$ _____ or _____

$f(-2) =$ _____ or _____

$f(-1) =$ _____ or _____

$f(0) =$ _____ or _____

$f(1) =$ _____ or _____

Input x	Rule $4x - 1$	Output $f(x)$
-3		
-2		
-1		
0		
1		

The domain is _____.

The range is _____.

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Check Your Progress

Complete the function table for $f(x) = 3x - 2$. Then state the domain and the range of the function.

Input x	Rule $3x - 2$	Output $f(x)$
-3		
-2		
-1		
0		
1		

EXAMPLE **Functions with Two Variables**

4 PARKING FEES **The price for parking at a city lot is \$3.00 plus \$2.00 per hour. Write a function to represent the price of parking for h hours. Then determine how much would it cost to park at the lot for 2 hours.**

Words Cost of parking equals \$3.00 plus \$2.00 per hour.

Function $p =$ ☐ $+$ ☐

The function $p =$ ☐ represents the situation.

Substitute ☐ for h into the function rule.

$p =$ ☐ $+$ ☐

$p = 3 + 2$☐ or ☐

It will cost ☐ to park for 2 hours.

Check Your Progress **TAXI** The price of a taxi ride is \$5.00 plus \$4.00 per hour. Write a function using two variables to represent the price of riding a taxi for h hours. Then determine how much would it cost for a 3-hour taxi ride.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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9–2 Representing Linear Functions

Standard 7AF1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.

MAIN IDEA

- Graph linear functions by using function tables and plotting points.

EXAMPLE

1 **MUSIC** **During a clearance sale, a music store is selling CDs for \$3 and tapes for \$1. Graph the function $3x + y = 6$ to find how many CDs and tapes Bill can buy with \$6.**

First, rewrite the equation by solving for y.

$3x + y = 6$ Write the equation.

$3x - \square + y = 6 - \square$ Subtract $\square$ from each side.

$y = 6 - 3x$ Simplify.

Choose values for x and substitute them to find y. Then graph the ordered pairs.

x	$y = 6 - 3x$	y	(x, y)
0	$y = 6 - 3\square$		
1	$y = 6 - 3\square$		
2	$y = 6 - 3\square$		

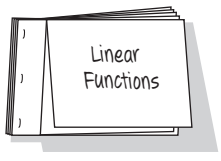
He cannot buy negative numbers of CDs or tapes, so the solutions are $\square$ CDs and $\square$ tapes, $\square$ CD and $\square$ tapes, or $\square$ CDs and $\square$ tapes.

Check Your Progress **BAKE SALE** During a bake sale, a plate of brownies is sold for \$2 and a plate of cookies is sold for \$1. Graph the function $2x + y = 4$ to find how many plates of brownies and cookies Craig can buy with \$4.

FOLDABLES™

ORGANIZE IT

In your Foldable, include a linear function and its graph.



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EXAMPLE **Graph a Function**

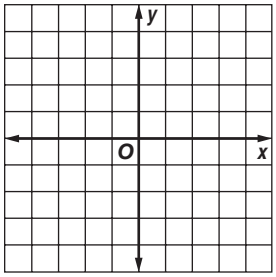
2 **Graph $y = x - 3$.**

Step 1 Choose some values for x. Make a function table. Include a column of ordered pairs of the form (x, y).

x	$x - 3$	y	(x, y)
0	$\square - 3$	$\square$	$\square$
1	$\square - 3$	$\square$	$\square$
2	$\square - 3$	$\square$	$\square$
3	$\square - 3$	$\square$	$\square$

Step 2 Graph each ordered pair.

Draw a line that passes through each point. Note that the ordered pair for any point on this line is a solution of $y = x - 3$. The line is the complete graph of the function.



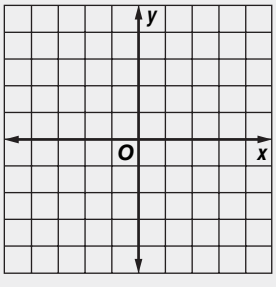
Check It appears from the graph that $(-1, -4)$ is also a solution. Check this by substitution.

$y = x - 3$ Write the function.

$\square \stackrel{?}{=} \square - 3$ Replace x and y.

$\square = \square$ Simplify.

Check Your Progress Graph $y = x - 2$.



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BUILD YOUR VOCABULARY (pages 221–222)

A function in which the graph of solutions forms a _____ is called a **linear function**.

The value of x where the graph crosses the _____ is called the ***x*-intercept**.

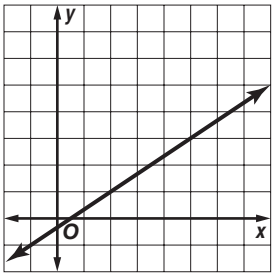
The value of y where the graph crosses the _____ is called the ***y*-intercept**.

EXAMPLE

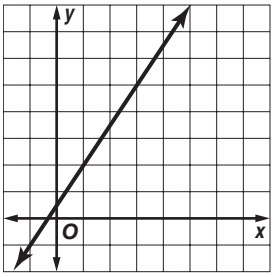
3 STANDARDS EXAMPLE **Which line graphed below best represents the table of values for the ordered pairs (x, y)?**

x	y
0	1
1	3
2	5
3	7

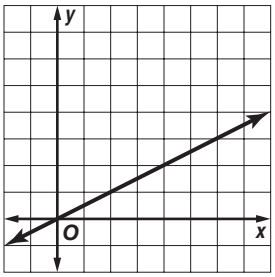
A



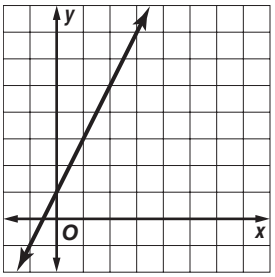
C



B



D



Read the Test Item

You need to decide which of the four graphs represents the data in the table.

Solve the Test Item

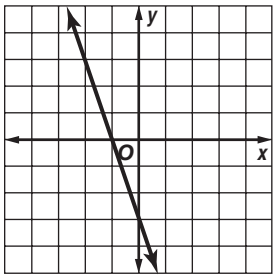
The values in the table represent the ordered pairs _____, _____, _____ and _____. Test the ordered pairs with each graph. Graph _____ is the only graph which contains all these ordered pairs. The answer is _____.

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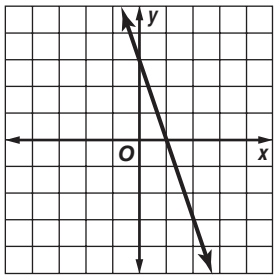
Check Your Progress **Which line graphed below best represents the table of values for the ordered pairs (x, y)?**

x	y
0	3
1	0
2	−3
3	−6

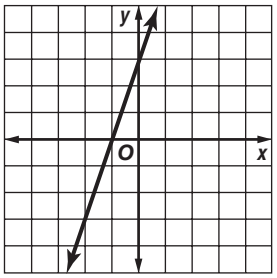
A



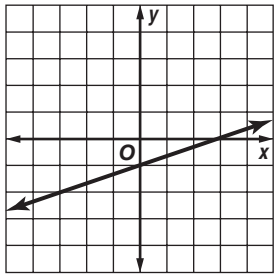
C



B



D



HOMEWORK ASSIGNMENT

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9–3 Slope

Standard 7AF3.3 Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.

MAIN IDEA
- Find the slope of a line using the slope formula.

BUILD YOUR VOCABULARY (pages 221–222)

Slope is the ____ of the **rise**, or ____ change, to the **run**, or ____ change.

EXAMPLE

1 **ACCESS RAMPS** **The access ramp from the sidewalk to the door of a hotel rises 8 inches for every horizontal change of 96 inches. What is the slope of the access ramp?**

slope = ____ Definition of slope

= ____ rise = ____ inches, run = ____ inches

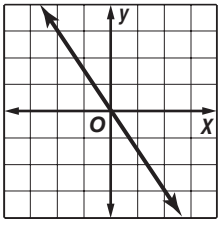
= ____ Simplify.

The slope of the access ramp is ____.

Check Your Progress **ACCESS RAMPS** The access ramp from the sidewalk to the door of an office building rises 14 inches for every horizontal change of 210 inches. What is the slope of the access ramp?

EXAMPLE **Find Slope Using a Graph**

2 **Find the slope of the line.**



Choose two points on the line. The vertical change is −3 units while the horizontal change is 2 units.

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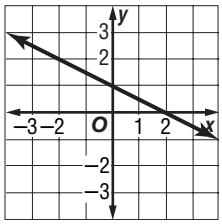
slope $= \frac{\text{rise}}{\text{run}}$ Definition of slope

$=$ ☐ rise $=$ ☐, run $=$ ☐

The slope of the line is ☐.

Check Your Progress

Find the slope of the line.



EXAMPLE **Find Slope Using a Table**

3 **The points given in the table lie on a line. Find the slope of the line. Then graph the line.**

x	-3	-1	1
y	-2	1	4

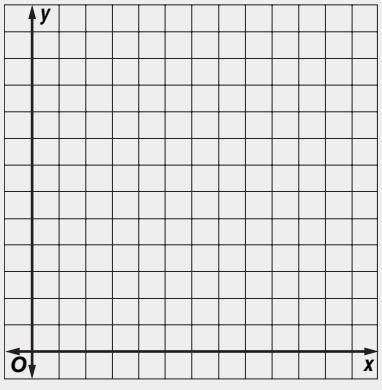
slope $= \frac{\text{change in } y}{\text{change in } x}$

$=$ ☐

$=$ ☐

The slope is ☐.

Check Your Progress The points given in the table below lie on a line. Find the slope of the line. Then graph the line.



x	y
2	5
5	7
8	9
11	11

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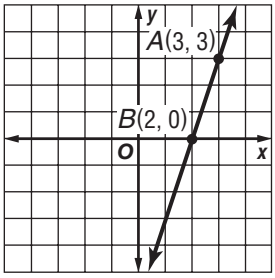
EXAMPLE **Positive Slope**

4 **Find the slope of the line that passes through $A(3, 3)$ and $B(2, 0)$.**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m = \frac{0 - 3}{2 - 3}$ $(x_1, y_1) = (3, 3)$ $(x_2, y_2) = (2, 0)$

$m = \frac{3}{1}$ or 3 Simplify.



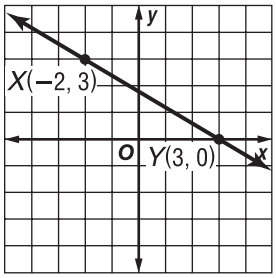
EXAMPLE **Negative Slope**

5 **Find the slope of the line that passes through $X(-2, 3)$ and $Y(3, 0)$.**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m = \frac{\square}{\square}$ $(x_1, y_1) = (-2, 3)$ $(x_2, y_2) = (3, 0)$

$m = \frac{-3}{5}$ or $-\frac{3}{5}$ Simplify.



Check Your Progress **Find the slope of the line that passes through each pair of points.**

a. $C(1, 2)$ and $D(2, 6)$

b. $E(-3, -4)$ and $F(0, -2)$

c. $G(-2, 5)$ and $H(4, -7)$

d. $J(0, 8)$ and $K(4, -2)$

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9–4 Direct Variation

MAIN IDEA

- Use direct variation to solve problems.

Standard 7AF3.4 Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.
Standard 7AF4.2 Solve multistep problems involving rate, average speed, distance, and time or a **direct variation.**

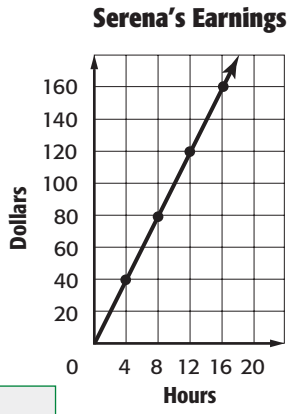
BUILD YOUR VOCABULARY (pages 221–222)

When two variable quantities have a _____, their relationship is called a **direct variation.**

The constant ratio is called the _____.

EXAMPLE 1 Find a Constant Ratio

EARNINGS The amount of money Serena earns at her job varies directly as the number of hours she works. Determine the amount Serena earns per hour.



Since the graph of the data forms a line, the rate of change _____.

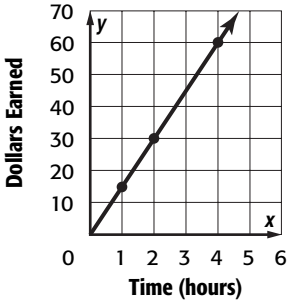
Use the graph to find _____.

$\frac{\text{amount earned}}{\text{hours worked}}$ → _____ _____ _____

Serena earns _____.

Check Your Progress

EARNINGS The amount of money Elizabeth earns at her job varies directly as the number of hours she works. Determine the amount Elizabeth earns per hour.



_____

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KEY CONCEPT

In a direct variation, the ratio of y to x is constant. This can be stated as *y varies directly with x*. A direct variation can be represented algebraically as $k = \frac{y}{x}$ or $y = kx$ where $k \neq 0$.

EXAMPLE **Solve a Direct Variation**

2 **SHOPPING** **The total cost for cans of soup varies directly as the number of cans purchased. If 4 cans of soup cost \$5, how much would it cost to buy 8 cans?**

METHOD 1 Use an equation.

Write an equation of direct variation. Let x represent the number of cans and let y represent the cost.

$y = kx$	Direct variation
$\square = k\square$	$y = \square$, $x = \square$
$1.25 = k$	Simplify.
$y = \square$	Substitute for $\square$.

Use the equation to find y when $x = 8$.

$y = 1.25x$

$y = 1.25\square$	$x = \square$
$y = \square$	Multiply.

METHOD 2 Use a proportion.

cans → $\frac{4}{5} = \frac{8}{y}$ ← cans

cost → cost

$\square = \square$	Find the cross products.
$4y = 40$	Multiply.
$\frac{4y}{4} = \frac{40}{4}$	Divide each side by 4.
$y = \square$	Simplify.

It would cost $\square$ to buy 8 cans.

Check Your Progress **SHOPPING** A grocery store sells 6 apples for \$2.70. How much would it cost to buy 10 apples?

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EXAMPLES Identify Direct Variation

Determine whether each linear function is a direct variation. If so, state the constant of variation.

3

Days, x	2	4	6	8
Hours worked, y	16	32	54	72

Compare the ratios to check for a common ratio.

$\frac{\text{hours}}{\text{days}}$ → [ ] [ ] [ ] [ ]

The ratios are [ ], so the function is [ ].

4

Hours, x	3	6	9	12
Miles, y	25.5	51	76.5	102

Compare the ratios to check for a common ratio.

$\frac{\text{miles}}{\text{hours}}$ → [ ] [ ] [ ] [ ]

Since the ratios are [ ], the function is a direct variation. The constant of variation is [ ].

Check Your Progress **Determine whether the linear function is a direct variation. If so, state the constant of variation.**

a.

Days, x	1	2	3	4
Hours worked, y	8	16	24	32

[ ]

b.

Hours, x	2	4	6	8
Miles, y	15	25	35	45

[ ]

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9–5 Slope-Intercept Form

Standard 7AF3.3 Graph linear functions, noting that the vertical change (change in *y*-value) per unit of horizontal change (change in *x*-value) is always the same and know that the ratio ("rise over run") is called the slope of a graph.

MAIN IDEA

- Graph linear equations using the slope and *y*-intercept.

BUILD YOUR VOCABULARY (pages 221–222)

Slope-intercept form is when an equation is written in the form ____, where *m* is the ____ and *b* is the ____.

EXAMPLES Find the Slopes and *y*-intercepts of Graphs

State the slope and the *y*-intercept of the graph of each equation.

1 $y = \frac{3}{4}x - 5$

$y = \frac{3}{4}x + (\quad)$ Write the equation in the form $y = mx + b$.

$y = mx + b$ $m = \frac{3}{4}$, $b =$ ____

The slope of the graph is ____, and the *y*-intercept is ____.

2 $2x + y = 8$

$2x + y = 8$ Write the original equation.

$-$ ____ $-$ ____ Subtract ____ from each side.

$y =$ ____ Simplify.

$y =$ ____ Write the equation in the form $y = mx + b$.

$y = mx + b$ $m =$ ____, $b =$ ____

The slope of the graph is ____ and the *y*-intercept is ____.

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Check Your Progress **State the slope and the *y*-intercept of the graph of each equation.**

a. $y = \frac{1}{4}x - 2$

b. $3x + y = 5$

EXAMPLE **Graph an Equation**

3 **Graph $y = \frac{2}{3}x + 2$ using the slope and *y*-intercept.**

Step 1 Find the slope and *y*-intercept.

$$y = \frac{2}{3}x + 2$$

slope $= \frac{2}{3}$

y-intercept $= 2$

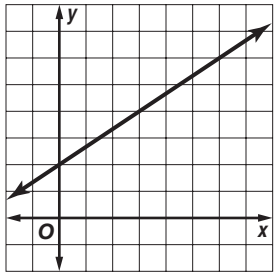
Step 2 Graph the *y*-intercept .

Step 3 Use the slope to locate a second point on the line.

$$m = \frac{2}{3}$$

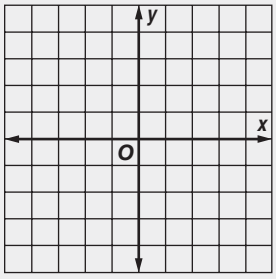
change in *y*: up 2 units

change in *x*: right 3 units



Step 4 Draw a line through the two points.

Check Your Progress Graph $y = \frac{1}{3}x + 3$ using the slope and *y*-intercept.



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9–6 Writing Systems of Equations and Inequalities

Standard 7AF1.1 Use variables and appropriate operations to write an expression, an equation, an inequality, **or a system of equations or inequalities that represents a verbal description** (e.g. three less than a number, half as large as area *A*.

MAIN IDEA

- Write systems of equations and inequalities.

BUILD YOUR VOCABULARY (pages 221–222)

A system of _____ consists of two equations and two unknowns. A system of _____ consists of two inequalities and two unknowns.

EXAMPLE **Writing Systems of Equations**

1 BALLOONING **At a hot air ballooning event, a blue balloon is 5 meters above the ground and rising at a rate of 20 meters per minute. A red balloon is 10 meters above the ground and rising at a rate of 18 meters per minute. Write a system of equations that represents this situation.**

Let h = the height of the balloons in meters, and let m = the number of minutes.

Blue balloon:

height of balloons	minus	meters	times	number of minutes	equals	initial height of balloon

Red balloon:

height of balloons	minus	meters	times	number of minutes	equals	initial height of balloon

So, the following system of _____ represents this situation.

_____

Check Your Progress **MONEY** Juan has 9 bills in his wallet. The bills are a combination of $1 bills and $5 bills. The value of the bills is $21. Write a system of equations that represents the number of bills Juan has.

_____

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EXAMPLE **Writing Systems of Inequalities**

2 **HEALTH** **Federico walks and jogs at least 5 miles each day. Federico walks 4.5 miles per hour and jogs 8.5 miles per hour. He only has a half-hour to exercise. Write a system of inequalities that represents this situation.**

Let w = the number of hours walked, and j = the number of hours jogged.

number of hours walked	plus	number of hours jogged	is less than or equal to	half hour

miles walked	times	hours walked	plus	miles jogged	times	hours jogged	is greater than or equal to	miles each day

So, the system of ____ is as follows.

Check Your Progress **HEALTH** Taylor runs and bikes at least 7 miles each day. She runs 6 miles per hour and bikes 12 miles per hour. She only has one hour to exercise each day. Write a system of inequalities that represents this situation.

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9–7 Problem-Solving Investigation: Use a Graph

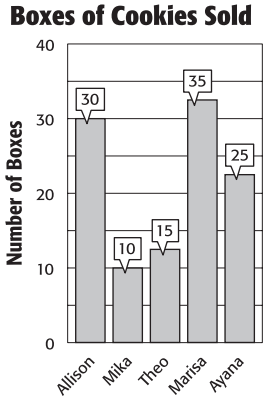
MAIN IDEA

- Solve problems by using a graph.

Standard 7MR2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
Standard 7SDP1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).

EXAMPLE Use a Graph

The graph shows how many boxes of cookies were sold by five students for a school fundraiser. How many boxes did the students sell altogether?



EXPLORE The graph shows you how many boxes were sold by each of five students. You want to know the total number of boxes sold by the students.

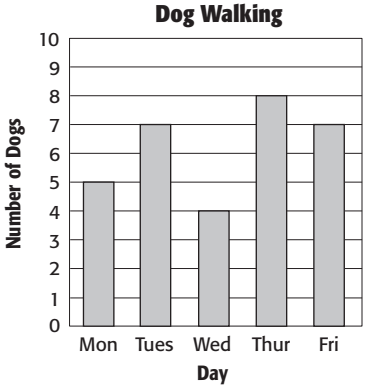
PLAN Use the graph to add the numbers of boxes sold.

SOLVE ☐ + ☐ + ☐ + ☐ + ☐ = ☐

The students sold ☐ altogether.

CHECK Look at the numbers at the top of each bar. Double check your sum.

Check Your Progress **PETS** The graph shows how many dogs Edmond walked each day this week. How many dogs did he walk altogether during the week?



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9–8 Scatter Plots



Standard 7SDP1.2 Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).

MAIN IDEA

- Construct and interpret scatter plots.

BUILD YOUR VOCABULARY (pages 221–222)

A **scatter plot** is a graph that shows the between _____ sets of data.

A **line of fit** is a line that is very close to _____ of the data points in a scatter plot.

EXAMPLE **Identify a Relationship**

Explain whether the scatter plot of the data for each of the following shows a *positive*, *negative*, or *no relationship*.

1. **cups of hot chocolate sold at a concession stand and the outside temperature**

As the temperature decreases, the number of cups of hot chocolate sold _____. Therefore, the scatter plot might show a _____ relationship.

2. **birthday and number of sports played**

The number of sports played does not depend on your birthday. Therefore, the scatter plot shows _____ relationship.

Check Your Progress **Determine whether a scatter plot of the data for the following might show a *positive*, *negative*, or *no relationship*.**

a. number of cups of lemonade sold at a concession stand and the outside temperature

b. age and the color of your hair

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EXAMPLE **Line of Fit**

ZOOS **The table at the right shows the average and maximum longevity of various animals in captivity.**

3 **Make a scatter plot using the data. Then draw a line that best seems to represent the data.**

Longevity (years)	
Average	Maximum
12	47
25	50
15	40
8	20
35	70
40	77
41	61
20	54

Source: *Walker's Mammals of the World*

4 **Write an equation for this line of fit.**

The line passes through points at ☐ and ☐.

Use these points to find the slope of the line.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m =$ ☐ $(x_1, y_1) =$ ☐, $(x_2\ y_2) =$ ☐

$m =$ ☐ Simplify.

The slope is ☐, and the y-intercept is ☐.

Use the slope and the y-intercept to write the equation.

$y = mx + b$ Slope-intercept form

$y =$ ☐ $x +$ ☐ $m =$ ☐, $b =$ ☐

The equation for the line of fit is ☐.

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5 **Use the equation to predict the maximum longevity for an animal with an average longevity of 33 years.**

$y = \frac{3}{2}x + 17.5$ Equation for the line of fit

$y = \frac{3}{2}$ ☐ $+ 17.5$ or ☐

The maximum longevity is about ☐.

Check Your Progress

The table shows the average hourly earnings of U.S. production workers since 1995.

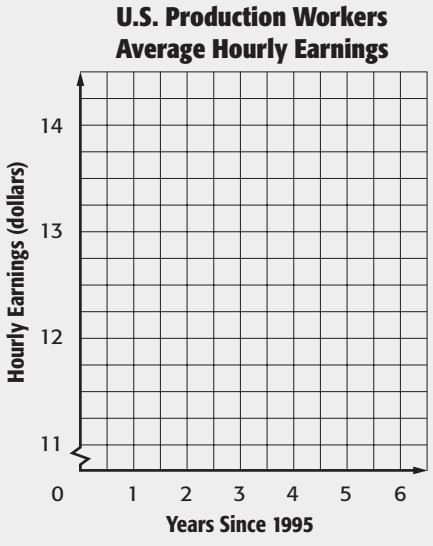
a. Make a scatter plot using the data.

b. Write an equation for the best-fit line using points (0, 11.43) and (5, 13.76).

c. Use the equation to predict the average hourly earnings of U.S. production workers in 2004.

U.S. Production Workers Earnings	
Year Since 1995	Average Hourly Earnings
0	$11.43
1	$11.82
2	$12.28
3	$12.78
4	$13.24
5	$13.76
6	$14.32

Source: *The World Almanac*



Homework Assignment

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CHAPTER 9

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 9 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 9, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 221–222*) to help you solve the puzzle.

9-1 Functions

Match each description with the word it describes.

a. independent variable
b. dependent variable
c. domain
d. range

1. an output value of a function ____
2. the set of values of the dependent variable ____
3. the underlined letter in $f(x) = 2\underline{x} + 5$ ____
4. Complete the function table for $fx = 2x + 2$. Then give the domain and range.

x	$2x + 2$	$f(x)$
-2		
0		
1		
3		

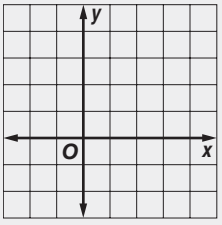
Domain: ____

Range: ____

9-2 Graphing Linear Functions

5. Complete the function table. Then graph $y = -x + 2$.

x	$-x + 2$	y	(x,y)
-2			
0			
1			
3			



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9-3

Slope

Find the slope of the line that passes through each pair of points.

6. $A(1, -2), B(4, 4)$ **7.** $C(1, 2), D(3, -2)$ **8.** $E(-1, 2), F(2, 2)$

9-4

Direction Variation

Determine whether each linear function is a direct variation. If so, state the constant of variation.

9.

hours, x	1	2	3	4
wages, y	\$6	\$12	\$18	\$24

10.

length, x	1	3	5	7
width, y	2	6	10	14

11.

hours, x	5	6	7	8
miles, y	480	415	350	285

12.

minutes, x	3	6	8	12
pages, y	66	132	176	264

9-5

Slope-Intercept Form

State the slope and the y-intercept for the graph of each equation.

13. $y = -3x + 4$ **14.** $y = \frac{2}{3}x - 7$ **15.** $\frac{1}{2}x + y = 8$

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9-6

Writing Systems of Equations and Inequalities

16. AGE The sum of Marcus' age plus three times Khung's age is 36. The difference of Khung's age minus Marcus' age is 18. Write a system of equations that represents their ages.

17. FUNDRAISER The school band is ordering two types of t-shirts to sell for a fundraiser. They want to make a profit of more than $600. T-shirt A sells for a profit of $4, and t-shirt B sells for a profit of $6. The band plans on selling at least 150 t-shirts. Write a system of inequalities to represent this situation.

9-7

Problem-Solving Investigation: Use a Graph

18. SHOPPING The Buy Online Company charges $1.50 per pound plus $2 for shipping and handling. The Best Catalog Company charges $1 per pound plus $5 for shipping and handling. Use a graph to determine the weight at which the shipping and handling will be the same for both companies.

9-8

Scatter Plots

19. Complete. A scatter plot that shows a negative relationship will have a pattern of data points that go _____.

Write whether a scatter plot of the data for the following might show a *positive*, *negative*, or *no relationship*.

20. favorite color and type of pet _____

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CHAPTER 9 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Math Online

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 9.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 9 Practice Test on page 517 of you textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 9 Study Guide and Review on pages 512–516 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 9 Practice Test on page 517.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 9 Foldable.
- Then complete the Chapter 9 Study Guide and Review on pages 512–516 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 9 Practice Test on page 517.

Student Signature

Parent/Guardian Signature

Teacher Signature

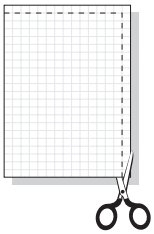
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CHAPTER 10

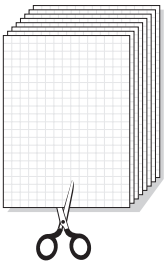
Algebra: Nonlinear Functions and Monomials

FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

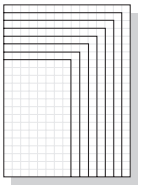
Begin with eight sheets of grid paper.



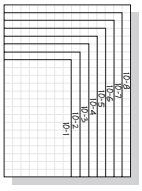
STEP 1 **Cut** off one section of the grid paper along both the long and short edges.



STEP 2 **Cut** off two sections from the second sheet, three sections from the third sheet, and so on to the 8th sheet.



STEP 3 **Stack** the sheets from narrowest to widest.



STEP 4 **Label** each of the right tabs with a lesson number.

NOTE-TAKING TIP: When you take notes, define new terms and write about the new concepts you are learning in your own words. Write your own examples that use the new terms and concepts.

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CHAPTER 10

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 10. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
cube root			
monomial			
nonlinear function			
quadratic function			

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10–1 Linear and Nonlinear Functions

Preparation for Standard AF1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.

MAIN IDEA

- Determine whether a function is linear or nonlinear.

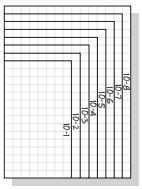
BUILD YOUR VOCABULARY (page 249)

Nonlinear functions do not have _____ rates of change. Therefore, their graphs are not straight lines.

FOLDABLES

ORGANIZE IT

Explain how to identify linear and nonlinear functions using graphs, equations, and tables on the Lesson 10-1 section of your Foldable.



EXAMPLES **Identify Functions Using Tables**

Determine whether each table represents a *linear* or *nonlinear* function. Explain.

1

		+2	+2	+2
x	2	4	6	8
y	2	20	54	104
		+18	+34	+50

As x increases by _____, y increases by a greater amount each time. The rate of change is not _____, so this function is _____.

2

		+3	+3	+3
x	1	4	7	10
y	0	9	18	27
		+9	+9	+9

As x increases by _____, y increases by _____ each time. The rate of change is _____, so this function is _____.

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Check Your Progress **Determine whether each table represents a *linear* or *nonlinear* function. Explain.**

a.

x	1	3	5	7
y	3	7	11	15

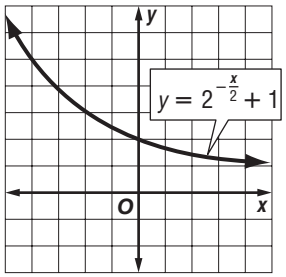
b.

x	1	2	3	4
y	1	8	27	64

EXAMPLES **Identify Functions Using Graphs**

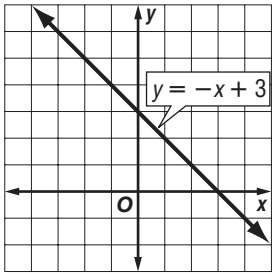
Determine whether each graph represents a *linear* or *nonlinear* function. Explain.

3



The graph is a curve, not a straight line. So it represents a _____ function.

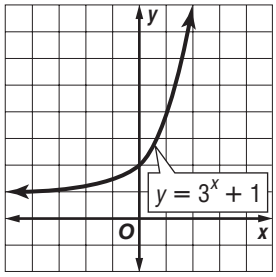
4



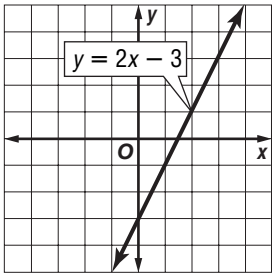
The graph is a straight line. So it represents a _____ function.

Check Your Progress **Determine whether each graph represents a *linear* or *nonlinear* function. Explain.**

a.



b.



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EXAMPLES **Identify Functions Using Equations**

Determine whether each equation represents a *linear* or *nonlinear* function. Explain.

5 $y = 5x^2 + 3$

Since x is raised to the _____ power, the equation cannot be written in the form $y = mx + b$. So, this function is _____.

6 $y - 4 = 5x$

Rewrite the equation as $y =$ _____. This equation is _____ since it is of the form $y = mx + b$.

Check Your Progress **Determine whether each equation represents a *linear* or *nonlinear* function. Explain.**

a. $y = x^2 - 1$

b. $y = x$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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10–2 Graphing Quadratic Functions

Standard 7AF1.5 Represent quantitative relationships graphically and interpret the meaning of a specific part of a graph in the situation represented by the graph.
Standard 7AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.

MAIN IDEA
- Graph quadratic functions.

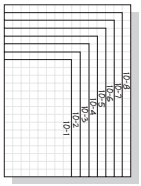
BUILD YOUR VOCABULARY (page 249)

A **quadratic function** is a function in which the [ ] power of the [ ] is [ ].

FOLDABLES

ORGANIZE IT

Record what you learn about graphing quadratic functions and using the graphs to solve problems on the Lesson 10-2 section of your Foldable.

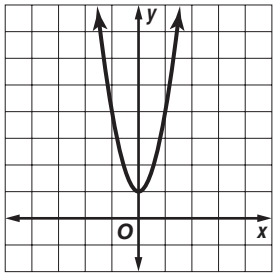


EXAMPLE **Graph Quadratic Functions**

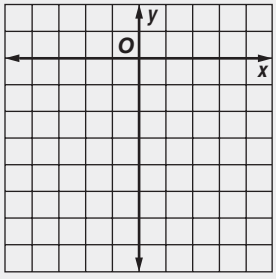
1 **Graph $y = 5x^2$.**

To graph a quadratic function, make a table of values, plot the ordered pairs, and connect the points with a smooth curve.

x	$5x^2$	y	(x, y)
-2	$5(-2)^2 =$ [ ]	[ ]	$(-2,$ [ ]$)$
-1	$5(-1)^2 =$ [ ]	[ ]	$(-1,$ [ ]$)$
0	$5(0)^2 =$ [ ]	[ ]	$(0,$ [ ]$)$
1	$5(1)^2 =$ [ ]	[ ]	$(1,$ [ ]$)$
2	$5(2)^2 =$ [ ]	[ ]	$(2,$ [ ]$)$



Check Your Progress Graph $y = -3x^2$.

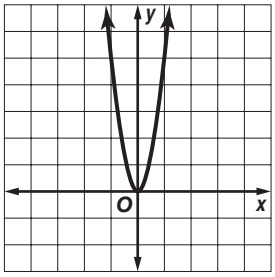


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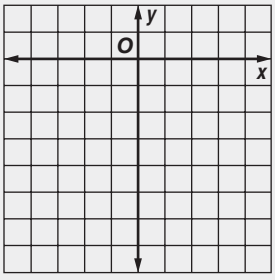
EXAMPLE **Graph Quadratic Functions**

2 **Graph $y = 3x^2 + 1$.**

x	$3x^2 + 1$	y	(x, y)
-2	$3(-2)^2 + 1 =$ ☐	☐	$(-2,$ ☐$)$
-1	$3(-1)^2 + 1 = 4$	4	$(-1, 4)$
0	$3(0)^2 + 1 =$ ☐	☐	$(0,$ ☐$)$
1	$3(1)^2 + 1 = 4$	4	$(1, 4)$
2	$3(2)^2 + 1 = 13$	13	$(2, 13)$



Check Your Progress Graph $y = -2x^2 - 1$.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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10–3 Problem-Solving Investigation: Make a Model

EXAMPLE Make a Model

MAIN IDEA

- Solve problems by making a model.

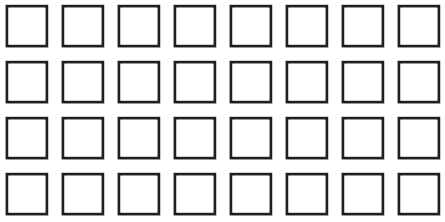
Standard 7MR2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
Standard 7AF1.1 Use variables and **appropriate operations to write an expression, an equation,** an inequality, or a system of equations or inequalities **that represents a verbal description** (e.g. three less than a number, half as large as area *A*.

DESKS **Caitlyn is arranging desks in her classroom. There are 32 desks, and she wants to have twice as many desks in each row as she has in each column. Use a model to determine how many desks she should put in each row and how many rows she will need.**

EXPLORE You know Caitlyn has 32 desks.

PLAN Experiment by arranging 32 tiles into different rows and columns until you have ____ as many tiles in each row as are in each column.

SOLVE



The correct arrangement is ____ rows with ____ desks in each row.

CHECK Check to see if the arrangement meets Caitlyn's original requirements.

Check Your Progress **TABLES** Mrs. Wilson wants to arrange tables into a square that is open in the middle and has 8 tables on each side. How many tables will she need altogether?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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10–4 Graphing Cubic Functions

MAIN IDEA

- Graph cubic functions.

Standard 7AF3.1 Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems. 7AF3.2 Plot the values from the volumes of three-dimensional shapes for various values of the edge lengths (e.g., cubes with varying edge lengths or a triangle prism with a fixed height and an equilateral triangle base of varying lengths).

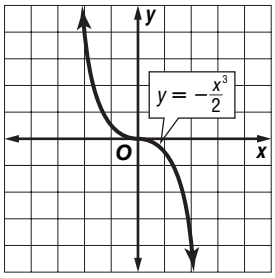
EXAMPLE Graph a Cubic Function

1 **Graph $y = -\frac{x^3}{2}$.**

Make a table of values.

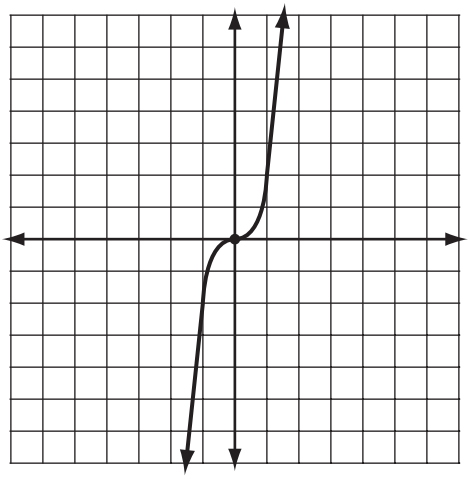
x	$y = -\frac{x^3}{2}$	(x, y)
-2	$-\left(\frac{(\square)^3}{2}\right) = -\left(\frac{\square}{2}\right) = -(\square) = \square$	
-1	$-\left(\frac{(\square)^3}{2}\right) = -\left(\frac{\square}{2}\right) = \square$	
0	$-\left(\frac{(\square)^3}{2}\right) = -\left(\frac{\square}{2}\right) = \square$	
1	$-\left(\frac{(\square)^3}{2}\right) = -\left(\frac{\square}{2}\right) = \square$	
2	$-\left(\frac{(\square)^3}{2}\right) = -\left(\frac{\square}{2}\right) = \square$	

Graph the function.



Check Your Progress

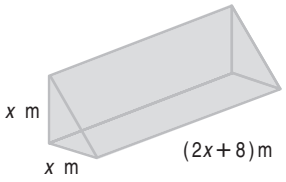
Graph $y = 2x^3$.



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EXAMPLE

2 **GEOMETRY** **Write a function for the volume V of the triangular prism. Graph the function. Then estimate the dimensions of the prism that would give a volume of approximately 40 cubic meters.**



$V = Bh$ ____ of a triangular prism

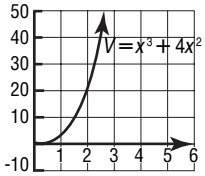
$V = \frac{1}{2} \cdot x \cdot x \cdot$ (____) Replace B with $\frac{1}{2} \cdot x \cdot x$ and h with (____).

$V =$ ____ $(2x + 8)$ $\frac{1}{2} \cdot x \cdot x =$ ____

$V = x$__ $+ 4x$__ Distributive Property

The function for the volume V of the box is $V =$ ____.

Make a table of values to graph this function. You do not need to include negative values of x since the side length of the prism cannot be negative.

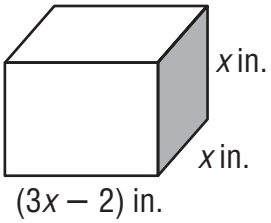


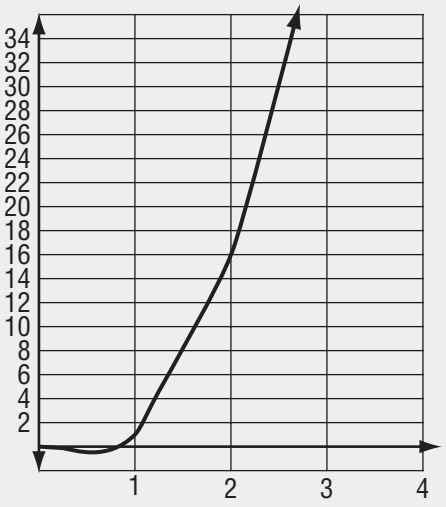
x	$V = x^3 + 4x^2$	(x, V)
0	$(0)^3 + 4(0)^2 =$ ____	____
0.5	$(0.5)^3 + 4(0.5)^2 \approx$ ____	____
1	$(1)^3 + 4(1)^2 =$ ____	____
1.5	$(1.5)^3 + 4(1.5)^2 \approx$ ____	____
2	$(2)^3 + 4(2)^2 =$ ____	____
2.5	$(2.5)^3 + 4(2.5)^2 \approx$ ____	____

To obtain a volume of about 40 cubic meters, the legs of the base are about ____ meters, and the height is $(2 \cdot$ ____ $+ 8)$ or about ____ meters.

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Check Your Progress **GEOMETRY** Write a function for the volume V of the rectangular prism. Graph the function. Then estimate the dimensions of the prism that would give a volume of approximately 34 cubic inches.





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10–5 Multiplying Monomials

Main Idea

- Multiply and divide monomials.

Key Concept

Product of Powers To multiply powers with the same base, add their exponents.

FOLDABLES In the Lesson 10–5 section of your Foldable, record the product of powers rule.

Standard 7NS2.3 Multiply, divide, and simplify rational numbers by using exponent rules. **Standard 7AF2.1 Interpret positive whole-number powers as repeated multiplication** and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. **Simplify and evaluate expressions that include exponents.** **Standard 7AF2.2 Multiply** and divide **monomials;** extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.

EXAMPLE 1 Multiply Powers

Find $7^6 \cdot 7^2$. Express using exponents.

$7^6 \cdot 7^2 = 7^{6+2}$ The common base is ☐.

$=$ ☐ ☐ the exponents.

Check $7^6 \cdot 7^2 = (7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7) \cdot (7 \cdot 7)$

$= 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$

$=$ ☐

Check Your Progress Find $2^5 \cdot 2^4$. Express using exponents.

EXAMPLE 2 Multiply Monomials

Find $7x^2(11x^4)$. Express using exponents.

$7x^2\,(11x^4) = (7 \cdot 11)$ ☐ Comm. and Assoc. Properties.

$=$ ☐ (x^{2+4}) The common base is ☐.

$=$ ☐ ☐ the exponents.

Check Your Progress Find $3x^2(-5x^5)$. Express using exponents.

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EXAMPLE **Multiply Negative Powers**

3 **Find $4^{-8} \cdot 4^3$. Express using positive exponents.**

METHOD 1

$4^{-8} \cdot 4^3 = 4^{\square}$ The common base is $\square$.

$= 4^{\square}$ $\square$ the exponents.

$= \square$ Simplify.

METHOD 2

$4^{-8} \cdot 4^3 = \square \cdot 4^{\square}$ Write 4^{-8} as $\frac{1}{4^8}$.

$= \frac{1}{4 \times 4 \times 4 \times 4 \times 4 \times \cancel{4} \times \cancel{4} \times \cancel{4} \times \cancel{4}} \times \cancel{4} \times \cancel{4} \times \cancel{4} \times \cancel{4}$ Cancel common values.

$= \square \cdot$ Simplify.

Check Your Progress Find $x^7 \cdot x^{-9}$. Express using positive exponents.

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10–6 Dividing Monomials

Main Idea

- Divide Monomials

Key Concept

Quotient of Powers To divide powers with the same base, subtract their exponents.

Standard 7NS2.3 Multiply, divide, and simplify rational numbers by using exponent rules.
Standard 7AF2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. **Simplify and evaluate expressions that include exponents.**
Standard 7AF2.2 Multiply and divide **monomials;** extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.

Homework Assignment

Page(s):

Exercises:

EXAMPLES Divide Powers

Simplify. Express using exponents.

1 $\frac{6^{12}}{6^2}$

$\frac{6^{12}}{6^2} = 6^{12-2}$ The common base is ☐.

$= $ ☐ Simplify.

2 $\frac{a^{14}}{a^8}$

$\frac{a^{14}}{a^8} = a^{14-8}$ The common base is ☐.

$= $ ☐ Simplify.

Check Your Progress **Simplify. Express using exponents.**

a. $\frac{3^{10}}{3^4}$

b. $\frac{x^{11}}{x^3}$

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EXAMPLES Use Negative Exponents

Simplify. Express using positive exponents.

3 $\frac{8^{-5}}{8^2}$

$\frac{8^{-5}}{8^2} = 8^{\square}$ Quotient of Powers

$= 8^{\square}$ or $\square$ Simplify.

4 $\frac{x^{-9}}{x^{-1}}$

$\frac{x^{-9}}{x^{-1}} = x^{\square}$ Quotient of Powers

$= x^{\square}$ Subtraction of a negative number

$= x^{\square}$ or $\square$ Simplify.

Check Your Progress **Simplify. Express using positive exponents.**

a. $\frac{5^9}{5^2}$

b. $\frac{n^{-3}}{n^{-1}}$

EXAMPLE

5 **STANDARDS EXAMPLE** **Simplify $\frac{8y^3}{16y^9}$. Express using positive exponents.**

A $2y^6$ **B** $\frac{1}{2y^6}$ **C** $\frac{1}{2y^3}$ **D** $\frac{y^6}{8}$

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Read the Test Item

You are asked to simplify the monomial.

Solve the Test Item

$\frac{8y^3}{16y^9} = \left(\frac{8}{16}\right)\left(\quad\right)$ Group terms

$= \frac{1}{2} \cdot y$ Quotient of Powers.

$= \frac{1}{2} \cdot y$ or Simplify.

The correct answer choice is .

Check Your Progress Simplify $\frac{x^4y^5}{x^7y^2}$. Express using positive exponents.

A x^3y^3 **D** $\frac{x^3}{y^3}$ **C** $\frac{y^3}{x^3}$ **D** $\frac{1}{x^3y^3}$

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10–7 Powers of Monomials

Standard 7AF2.2 Multiply and divide monomials; **extend the process of taking powers and** extracting roots **to monomials** when the latter results in a monomial with an integer exponent.

MAIN IDEA

- Find powers of monomials.

EXAMPLES Find the Power of a Power

1 **Simplify $(5^2)^8$.**

$(5^2)^8 = 5^{\square}$ Power of a Power

$= \square$ Simplify.

KEY CONCEPT

Power of a Power To find the power of a power, multiply the exponents.

FOLDABLES In the Lesson 10–7 section of your Foldable, record the power of a power rule.

2 **Simplify $(a^3)^7$.**

$(a^3)^7 = a^{\square}$ Power of a Power

$= \square$ Simplify.

Check Your Progress **Simplify.**

a. $(3^4)^5$

b. $(m^9)^2$

EXAMPLES Power of a Product

3 **Simplify $(3c^4)^3$.**

$(3c^4)^3 = 3^{\square} \cdot c^{\square}$ Power of a Product

$= \square$ Simplify.

4 **Simplify $(-4p^5q)^2$.**

$(-4p^5q)^2 = (-4)^{\square} \cdot p^{\square} \cdot q^{\square}$ Power of a Product

$= \square$ Simplify.

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Check Your Progress **Simplify.**

a. $(4x^6)^2$

b. $(-3a^4b^2)^3$

EXAMPLE

5 **GEOMETRY** **Find the volume of a cube with sides of length $6mn^7$ as a monomial.**

$V = s^3$ ☐ of a cube

$V = (\square)^3$ Replace s with ☐.

$V = 6\square m\square n\square$ Power of a Product

$V = \square$ Simplify.

The volume of the cube is ☐ cubic units.

Check Your Progress **GEOMETRY** Find the volume of a cube with sides of length $4a^2b$ as a monomial.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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10–8 Roots of Monomials

Standard 7AF2.2 Multiply and divide monomials; **extend the process of** taking powers and **extracting roots to monomials when the latter results in a monomial with an integer exponent.**

MAIN IDEA
- Find roots of monomials.

BUILD YOUR VOCABULARY (page 249)

The square root of a monomial is one of the ____ equal factors of the monomial. The ____ **root** of a monomial is one of the three equal factors of the monomial.

EXAMPLES Simplify Square Roots

1 **Simplify $\sqrt{9k^4}$.**

$\sqrt{9k^4} = \sqrt{9} \cdot \sqrt{\quad}$ Product Property of Square Roots

$= \quad$ $3 \cdot 3 = \quad$; $p^2 \cdot p^2 = \quad$

2 **Simplify $\sqrt{400w^8x^2}$.**

$\sqrt{400w^8x^2} = \sqrt{\quad} \cdot \sqrt{w^8} \cdot \sqrt{x^2}$ Product Property of Square Roots

$= 20 \cdot \quad \cdot |x|$ $20 \cdot 20 = \quad$;

$w^4 \cdot w^4 = w^{\quad}$; $x \cdot x = x^2$

$= \quad$ Use absolute value to indicate the positive value of x.

Check Your Progress **Simplify.**

a. $\sqrt{25d^2}$ ____ **b.** $\sqrt{121r^4s^6}$ ____

EXAMPLES Simplify Cube Roots

3 **Simplify $\sqrt[3]{a^6}$.**

$\sqrt[3]{a^6} = \quad$ $(a^2)^3 = \quad$

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FOLDABLES In the Lesson 10–8 section of your Foldable, record the Product Property of Square Roots and the Product Property of Cube Roots.

4 **Simplify $\sqrt[3]{343m^{12}}$.**

$\sqrt[3]{343m^{12}} = \sqrt[3]{\square} \cdot \sqrt[3]{m^{12}}$ Product Property of Cube Roots

$= \sqrt[3]{\square} \cdot \sqrt[3]{m^4 \times m^4 \times m^4}$

$= \square$ Simplify.

Check Your Progress **Simplify.**

a. $\sqrt[3]{y^3}$ **b.** $\sqrt[3]{64h^9}$

EXAMPLE

5 **GEOMETRY Find the length of one side of a cube whose volume is $729g^{18}$ cubic units.**

$V = s^3$ $\square$ of a cube

$\square = s^3$ Replace V with $\square$.

$\sqrt[3]{729g^{18}} = \sqrt[3]{s^3}$ Definition of $\square$ root

$\sqrt[3]{729} \cdot \sqrt[3]{g^{18}} = \square$ Product Property of Cube Roots

$\square = s$ Simplify.

The length of one side of the cube is $\square$ units.

Check Your Progress **GEOMETRY** Find the length of one side of a cube whose volume is $216x^{15}$ cubic units.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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CHAPTER 10

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 10 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 10, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 249*) to help you solve the puzzle.

10-1

Linear and Nonlinear Functions

Write *linear* or *nonlinear* to name the kind of function described.

1. constant rate change

2. graph that is a curve

3. power of x may be greater than one

4. equation has the form $y = mx + b$

5. Name the kind of function represented. Explain your reasoning.

x	−3	0	3	6
y	10	1	10	37

10-2

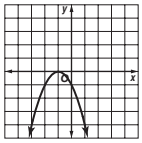
Graphing Quadratic Functions

Determine whether each equation represents a quadratic function. Write *yes* or *no*.

6. $y = 3x - 5$

7. $y = 6 - x^2$

8.



9. Explain how to graph a quadratic function.

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10-3

Problem-Solving Investigation: Make a Model

10. **DESIGN** Edu-Toys is designing a new package to hold a set of 30 alphabet blocks. Each block is a cube with each side of the cube being 2 inches long. Give two possible dimensions for the package.

10-4

Graphing Cubic Functions

Determine whether each equation represents a cubic function. Write *yes* or *no*.

11. $y = -3x^2$ **12.** $y = \frac{1}{3}x^3$ **13.** $y = -x^3 + 5$

14. Explain the difference in the graph of a quadratic function and the graph of a cubic function.

10-5

Multiplying Monomials

Complete each sentence.

15. To multiply powers with the same base, _____ their exponents.

Simplify. Express using exponents.

16. $5^2 \cdot 5^6$ **17.** $2x^2 \cdot 4x^3$ **18.** $(8x^3)(-3x^9)$

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10-6

Dividing Monomials

19. To divide powers with the same base, [ ] their exponents.

Simplify. Express using positive exponents.

20. $\frac{2^5}{2^2}$ [ ]

21. $\frac{w^3}{w^8}$ [ ]

22. $\frac{18a^7}{6a^3}$ [ ]

10-7

Powers of Monomials

23. To find the power of a power, [ ] the exponents.

Simplify.

24. $(8^2)^3$ [ ]

25. $(k^4)^5$ [ ]

26. $(4a^2b^4)^4$ [ ]

10-8

Roots of Monomials

Simplify.

27. $\sqrt{n^4}$ [ ]

28. $\sqrt{36x^2y^8}$ [ ]

29. $\sqrt[3]{27d^9}$ [ ]

30. To find the length of one side of a square when given its area, find the [ ] root of the area.

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CHAPTER 10 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 10.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 10 Practice Test on page 561 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 10 Study Guide and Review on pages 557–560 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 10 Practice Test on page 561.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 10 Foldable.
- Then complete the Chapter 10 Study Guide and Review on pages 557–560 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 10 Practice Test on page 561.

Student Signature

Parent/Guardian Signature

Teacher Signature

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CHAPTER 11

Statistics

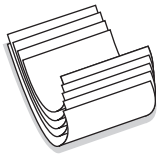
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with five pieces of $8\frac{1}{2}$" × 11" paper.

STEP 1 **Place** 4 sheets of paper $\frac{3}{4}$ inch apart.



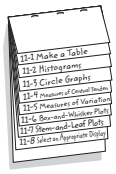
STEP 2 **Roll** up bottom edges. All tabs should be the same size.



STEP 3 **Crease** and staple along the fold.



STEP 4 **Label** the tabs with the topics from the chapter. Label the last tab Vocabulary.



NOTE-TAKING TIP: As you take notes on a topic, it helps to write how the subject relates to your life. For example, as you learn about different kinds of statistical measures and graphs, you will understand how to evaluate statistical information presented in such places as advertisements and persuasive articles in magazines.

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CHAPTER 11

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 11. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
back-to-back stem-and-leaf plot			
box-and-whisker plot			
circle graph			
histogram			
interquartile range			
leaves			
lower quartile			
mean			

(continued on the next page)

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Vocabulary Term	Found on Page	Definition	Description or Example
measures of central tendency			
measures of variation			
median			
mode			
outlier			
quartiles			
range			
stem-and-leaf plot			
stems			
upper quartile			

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11–1 Problem-Solving Investigation: Make a Table

MAIN IDEA

- Solve problems by making a table.

Standard 7MR2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, **tables,** diagrams, and models, to explain mathematical reasoning.
Standard 7SDP1.1 Know various forms of display for data sets, including stem-and-leaf plot or box-and-whisker plot; **use the forms to display a single set of data or to compare two sets of data.**

EXAMPLE Make a Table

The list shows the ages of 25 persons selected at random from the audience of a recent showing of a comedy movie. Make a frequency table of the ages using intervals 17–24, 25–32, 33–40, 41–48, and 49–56. What is the most common interval of attendance ages?

26	42	22	26	24
21	27	35	28	18
19	25	46	31	29
17	56	19	41	23
38	20	21	25	22

EXPLORE You have a list of ages. You need to know how many ages fall into each interval.

PLAN Make a table to show the frequency, or number, of ages in each interval.

SOLVE The greatest frequency is ages [ ], so this is the most common interval of attendance ages.

CHECK Make sure the frequency table includes each age from the list.

Check Your Progress

The list shows the favorite sports of 25 people selected at random. In the list, S represents soccer, B represents baseball, F represents football, and V represents volleyball. Make a frequency table of the favorite sports. What is the most popular sport?

V	B	S	F	V
S	V	F	V	S
S	F	B	S	B
B	S	V	F	S
F	F	B	S	V

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–2 Histograms

Standard 7SDP1.1 Know various forms of display for data sets, including stem-and-leaf plot or box-and-whisker plot; **use the forms to display a single set of data or to compare two sets of data.**

MAIN IDEA

- Construct and interpret histograms.

BUILD YOUR VOCABULARY (pages 273–274)

A **histogram** is a type of _____ graph used to display numerical data that have been organized into _____ intervals.

EXAMPLE Construct a Histogram

1 FOOD The list shows the number of grams of caffeine in certain types of tea. Use intervals 1–20, 21–40, 41–60, 61–80, and 81–100 to make a frequency table. Then construct a histogram.

8	47	19	34	30
10	58	20	39	32
12	4	22	40	92
18	85	26	27	

Place a tally mark for each value in the appropriate interval. Then add up the tally marks to find the frequency for each interval.

To construct a histogram, follow these steps.

Step 1 Draw and label a horizontal and vertical axis. Include a title.

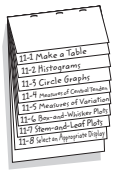
Step 2 Show the _____ from the frequency table on the _____ axis.

Step 3 For each caffeine interval, draw a bar whose height is given by the frequencies.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 11–2, explain the difference between a bar graph and a histogram. Describe a type of statistics that could be displayed with a histogram.



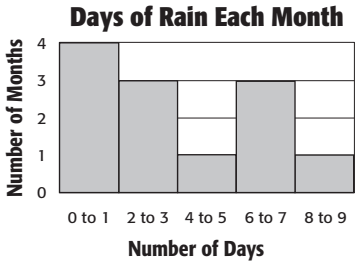
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Check Your Progress The frequency table below shows the amount of caffeine in certain drinks. Draw a histogram to represent the data.

Caffeine Content of Certain Types of Drink		
Caffeine (mg)	Tally	Frequency
0–50	𝍸	3
51–100	𝍸	4
101–150	𝍸 |	6
151–200	𝍸 ||	7

EXAMPLES Analyze and Interpret Data

2 WEATHER How many months had 6 or more days of rain?



Three months had _____ days of rain, and one month had _____ days of rain.

Therefore, _____ + _____ or _____ months had 6 or more days of rain.

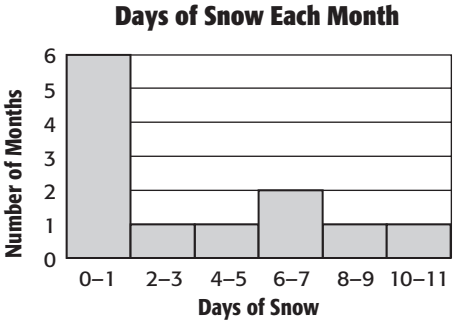
3 WEATHER How many months had exactly 2 days of rain?

This cannot be determined from the data presented in this graph. The histogram indicates that there were _____ that had 2 or 3 days of rain, but it is impossible to tell how many months had _____ days of rain.

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Check Your Progress

a. How many months had 6 or more days of snow?



b. How many months had exactly 6 days of snow?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–3 Circle Graphs

Standard 7SDP1.1 Know various forms of display for data sets, including stem-and-leaf plot or box-and-whisker plot; **use the forms to display a single set of data** or to compare two sets of data.

MAIN IDEA

- Construct and interpret histograms.

BUILD YOUR VOCABULARY (pages 273–274)

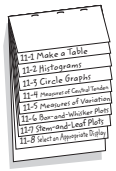
A **circle graph** is used to compare parts of a _____.

The entire _____ represents that whole.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 11–3, find an example of a circle graph from a newspaper or magazine. Explain what the graph shows.



EXAMPLE **Construct a Circle Graph from Percents**

1 TORNADOES The table shows when tornadoes occurred in the United States from 1999 to 2001. Make a circle graph using this information.

Tornadoes in the United States, 1999–2001	
January–March	15%
April–June	53%
July–September	21%
October–December	11%

Source: spc.noaa.gov/

Step 1 There are _____ in a circle. So, multiply each percent by 360 to find the number of degrees for each _____ of the graph.

Jan–Mar:

15% of 360 = _____ · 360 or _____

Apr–Jun:

53% of 360 = _____ · 360 or about _____

Jul–Sept:

21% of 360 = _____ · 360 or about _____

Oct–Dec:

11% of 360 = _____ · 360 or about _____

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Step 2 Use a compass to draw a circle and a radius. Then use a protractor to draw a [ ] angle. This section represents January–March. From the new radius, draw the next angle. Repeat for each of the remaining angles. Label each [ ]. Then give the graph a [ ].

Check Your Progress

HURRICANES The table shows when hurricanes or tropical storms occurred in the Atlantic Ocean during the hurricane season of 2002. Make a circle graph using this information.

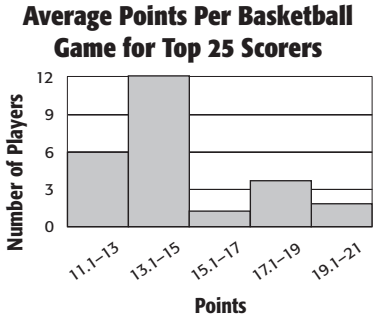
Hurricanes in the United States, 2002	
Month	**Percent**
July	7%
August	21%
September	64%
October	8%

Source: nhc.noaa.gov/

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EXAMPLES Construct a Circle Graph from Data

2 BASKETBALL Construct a circle graph using the information in the histogram below.



Step 1 Find the total number of players.

$6 + \square + 1 + \square + 2 = \square$

Step 2 Find the ratio that compares the number in each point range to the total number of players. Round to the nearest hundredth.

11.1 to 13 : $6 \div 25 = \square$

13.1 to 15 : $12 \div 25 = \square$

15.1 to 17 : $1 \div 25 = \square$

17.1 to 19 : $4 \div 25 = \square$

19.1 to 21 : $2 \div 25 = \square$

Step 3 Use these ratios to find the number of degrees of each section. Round to the nearest degree if necessary.

11.1 to 13 : $\square \cdot 360 = \square$ or about $\square$

13.1 to 15 : $\square \cdot 360 = \square$ or about 173

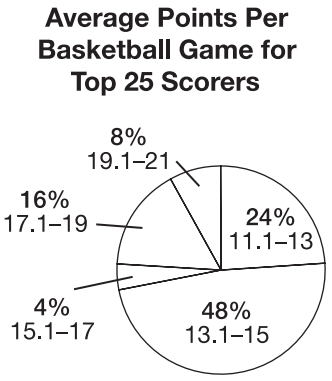
15.1 to 17 : $\square \cdot 360 = \square$ or about $\square$

17.1 to 19 : $\square \cdot 360 = \square$ or about $\square$

19.1 to 21 : $\square \cdot 360 = \square$ or about 29

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Step 4 Use a compass and protractor to draw a circle and the appropriate sections. Label each section and give the graph a title. Write the ratios as percents.

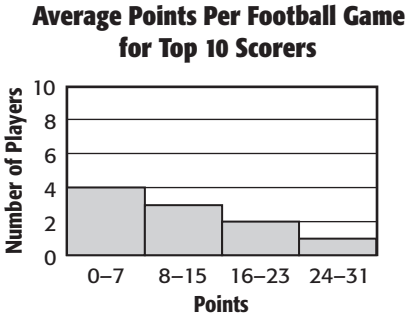


3 **Use the circle graph from Example 2 to describe the makeup of the average game scores of the 25 top-scoring basketball players.**

Almost $\frac{3}{4}$ of the players had average game scores between 11.1 and 15 points. Fewer than $\frac{1}{4}$ had average game scores greater than ☐ points.

Check Your Progress

a. Construct a circle graph using the information in the histogram at right.



b. Use the graph to describe the makeup of the average game scores of the 10 top-scoring football players.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–4 Measures of Central Tendency and Range



Standard 7SDP1.3 Understand the meaning of, and be able to compute, the minimum, the lower quartile, **the median,** the upper quartile, and the maximum of a data set.

MAIN IDEA

- Find the mean, median, mode, and range of a set of data.

BUILD YOUR VOCABULARY (pages 273–274)

Measures of central tendency are numbers that _____ a set of data.

The **mean** of a set of data is the _____ of the data _____ the number of items in the data set.

The **median** of a set of data is the _____ number of the data ordered from least to greatest, or the mean of the _____ numbers.

The **mode** of a set of data is the number or numbers that occur _____ often.

The **range** of a set of data is _____ between the greatest and least numbers in a set of data.

WRITE IT

The words *central* and *middle* have similar definitions. If mean, median, and mode are measures of central tendency, what do they measure?

_____

_____

_____

_____

EXAMPLE **Find Measures of Central Tendency**

1 **The ages, in years, of the actors in a play are 4, 16, 32, 19, 27, 32. Find the mean, median, mode, and range of the data.**

Mean $\dfrac{4 + 16 + 32 + 19 + 27 + 32}{\square} = \square$

$\approx \square$

Meadian Arrange the numbers in order from _____ to _____.

4 16 19 27 32 32

$\dfrac{\square + \square}{\square} = \square$

(continued on the next page)

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Mode The data has a mode of ☐.

Range 32 − 4 or ☐.

Check Your Progress The ages, in years, of the children at a daycare center are 3, 5, 3, 7, 6, 4. Find the mean, median, mode, and range of the set of data.

☐

EXAMPLE **Using Appropriate Measures**

2 **OLYMPICS** **Select the appropriate measure of central tendency or range to describe the data in the table. Justify your reasoning.**

Gold Medals Won by the United States at the Winter Olympics, 1924–2002			
Event	Gold Medals	Event	Gold Medals
Alpine skiing	10	Luge	2
Bobsleigh	6	Short track speed skating	3
Cross country	0	Skeleton	3
Figure skating	13	Ski jumping	0
Freestyle skiing	4	Snowboarding	2
Ice hockey	3	Speed skating	26

Find the mean, median, mode, and range of the data.

Mean $\frac{10 + 6 + 0 + 13 + 4 + 3 + 2 + 3 + 3 + 0 + 2 + 26}{\square} = \frac{\square}{\square}$

$= \square$

The mean is ☐ medals.

Median Arrange the numbers from least to greatest.

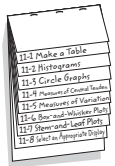
0, 0, 2, 2, 3, 3, 3, 4, 6, 10, 13, 26

The median is the middle number, or ☐ medals.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 11–4, record how to find the mean, median, and mode of a set of data. Explain *measures of central tendency, mean, median,* and *mode* in your own words and with examples.



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Mode There is one mode, [ ].

Range 26 − 0 or [ ].

Check Your Progress Select the appropriate measure of central tendency or range to describe the data in the table. Justify your reasoning.

Country	Gold Medals (1896–2002 Summer)
United States	872
Great Britain	180
France	188
Italy	179
Sweden	136
Hungary	150
Australia	102
Finland	101
Japan	97
Romania	74
Brazil	12
Ethiopia	12

Source: infoplease.com

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–5 Measures of Variation



Standard 7SDP1.3 Understand the meaning of, and be able to compute, the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.

Main Idea

- Find the range and quartiles of a set of data.

Key Concepts

Range The range of a set of data is the difference between the greatest and the least numbers in the set.

Interquartile Range The interquartile range is the range of the middle half of the data. It is the difference between the upper quartile and the lower quartile.

Build Your Vocabulary (pages 273–274)

Measures of variation are used to describe the _____ of a set of data.

The **range** indicates how _____ the data are.

Quartiles are the values that divide the data into _____ equal parts.

The _____ of the lower half of a set of data is the **lower quartile.**

The median of the _____ of the set of data is the **upper quartile.**

Data that are more than _____ times the value of the interquartile range beyond the quartiles are called **outliers.**

Example 1 Find Measures of Variation

BASKETBALL **Find the measures of variation for the data in the table.**

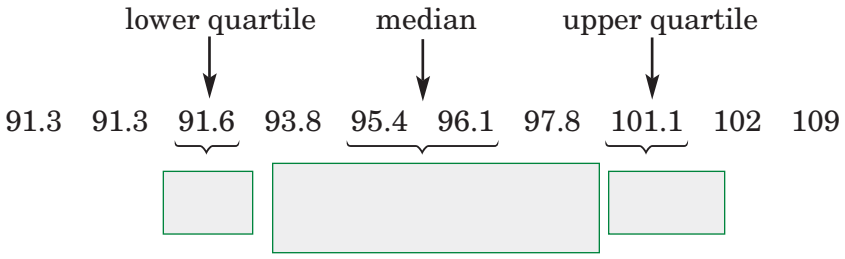
The range is 109 − 91.3 or _____.

Points Scored by Top Ten Teams During the NBA Playoffs, 2002	
Team	**Points Scored**
Dallas	109
Minnesota	102
Sacramento	101.1
L.A. Lakers	97.8
Charlotte	96.1
New Jersey	95.4
Orlando	93.8
Indiana	91.6
Boston	91.3
Portland	91.3

Source: nba.com

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Median, Upper Quartile, and Lower Quartile
Arrange the numbers in order from least to greatest.



The median is ____, the lower quartile is ____, and the upper quartile is ____.

Interquartile Range = upper quartile − lower quartile

= ____

REMEMBER IT

A small interquartile range means that the data in the middle of the set are close in value. A large interquartile range means that the data in the middle are spread out.

Check Your Progress **BASEBALL** Find the measures of variation for the data in the table.

Giants Batting Average Against Anaheim in the World Series 2002

Player	Batting Average
Rueter	0.500
Bonds	0.471
Snow	0.407
Bell	0.304
Lofton	0.290
Kent	0.276
Aurilia	0.250
Sanders	0.238
Santiago	0.231

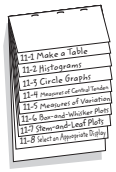
Source: infoplease.com

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FOLDABLES

ORGANIZE IT

Under the tab for Lesson 11–5, write what you learn about finding the range and quartiles of a set of data.



EXAMPLE **Find Outliers**

2 **CONCESSION SALES** **Find any outliers for the data in the table at the right.**

First arrange the numbers in order from least to greatest. Then find the median, upper quartile, and lower quartile.

Item Sold at Football Game Concession Stand	
Item	Number Sold
Colas	196
Diet colas	32
Water	46
Coffee	18
Candy bars	39
Hotdogs	23
Hamburgers	16
Chips	41
Popcorn	24

16 18 23 24 32 39 41 46 196

$\frac{18 + 23}{2} =$ ☐ 32 $\frac{41 + 46}{2} =$ ☐

Interquartile Range = ☐ − ☐ or 23

Multiply the interquartile range, 23, by 1.5. ☐ × ☐ = 34.5

Find the limits for the outliers.

Subtract 34.5 from the lower quartile. ☐ − 34.5 = ☐

Add 34.5 to the upper quartile. ☐ + 34.5 = ☐

The limits for the outliers are ☐ and ☐.

The only outlier is ☐.

Check Your Progress

Find any outliers for the data in the table at right.

☐

Items Sold at School Bookstore	
Item	Number Sold
Pens	35
Pencils	15
Erasers	20
Candy bars	93
Folders	17
School Pennants	18
Calculators	2

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–6 Box-and-Whisker Plots

Standard 7SDP1.1 Know various forms of display for data sets, including stem-and-leaf plot or **box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.**

MAIN IDEA

- Display and interpret data in a box-and-whisker plot.

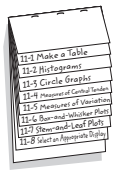
BUILD YOUR VOCABULARY (pages 273–274)

A **box-and-whisker plot** uses a _____ to show the _____ of a set of data.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 11–6, collect data from the Internet, such as number of homeruns hit by the players of a baseball team. Draw a box-and-whisker plot to display the data.



EXAMPLE 1 **Draw a Box-and-Whisker Plot**

POPULATION Use the data in the table at the right to construct a box-and-whisker plot.

World's Most Populous Cities	
City	Population (millions)
Tokyo	34.8
New York	20.2
Seoul	19.9
Mexico City	19.8
Sao Paulo	17.9
Bombay	17.9
Osaka	17.9
Los Angeles	16.2
Cairo	14.4
Manila	13.5

Source: *Time Almanac*

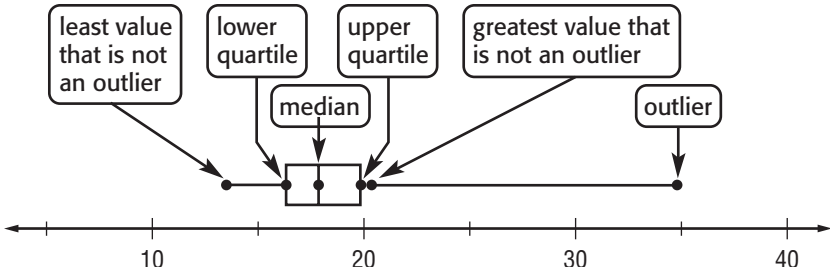
Step 1 Draw a _____ that includes the least and greatest number in the data.

Step 2 Mark the extremes, the _____, and the upper and lower _____ above the number line. Since the data have an outlier, mark the greatest value that is not an _____.

Step 3 Draw the box and whiskers.

(continued on the next page)

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Check Your Progress

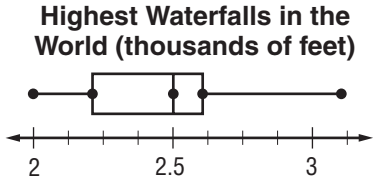
Use the data in the table at the right to draw a box-and-whisker plot.

Most Populous U.S. Cities	
City	Population (in millions)
New York	8.0
Los Angeles	3.7
Chicago	2.9
Houston	2.0
Philadelphia	1.5
Phoenix	1.3
San Diego	1.2
Dallas	1.2

Source: infoplease.com

EXAMPLE **Interpret Data**

2 **WATERFALLS** **What do the lengths of the parts of the box-and-whisker plot below tell you about the data?**

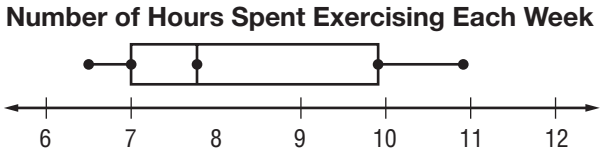


Source: *Time Almanac*

Data in the _____ quartile are more spread out than the data in the _____ quartile. You can see that data in the _____ quartile are the most spread out because the whisker is _____ than other parts of the plot.

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Check Your Progress What do the lengths of the parts of the box-and-whisker plot below tell you about the data?



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–7 Stem-and-Leaf Plots

Standard 7SDP1.1 Know various forms of display for data sets, including stem-and-leaf plot or box-and-whisker plot; **use the forms to display a single set of data or to compare two sets of data.**

MAIN IDEA

- Display data in stem-and-leaf plots. Interpret data in stem-and-leaf plots.

BUILD YOUR VOCABULARY (pages 273–274)

The numerical data are listed in ascending or _____ order in a **stem-and-leaf plot**. The greatest place value of the data are used for the _____. The _____ form the next greatest place value.

EXAMPLE Draw a Stem-and-Leaf Plot

1 FOOD Display the data in the table in a stem-and-leaf plot with or without the use of technology.

Peanuts Harvested, 2005	
State	Amount (lb/acre)
Alabama	2,800
Florida	2,900
Georgia	3,000
New Mexico	3,200
North Carolina	3,100
Oklahoma	3,200
South Carolina	3,200
Texas	3,500
Virginia	2,800

Step 1 Find the least and greatest number. Then identify the greatest place value digit in each number.

- The least number, _____, has 2 in the thousands place.
- The greatest number, _____, has 3 in the thousands place.

Step 2 Draw a vertical line and write the stems, 2 and 3, to the _____ of the line.

Step 3 Write the leaves to the _____ of the line, with the corresponding stem. For example, for 2,800, write 8 to the right of _____.

Stem	Leaf
2	8 8 9
3	0 1 2 2 2 5

$2|8 = 2{,}800$ *lb*

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Check Your Progress

BASEBALL Display the data in the table in a stem-and-leaf plot with or without the use of technology.

Most Home Runs in a Single Season	
Player	**Home Runs**
Barry Bonds	73
Jimmie Foxx	58
Roger Maris	61
Mark McGwire	65
Mark McGwire	70
Babe Ruth	59
Babe Ruth	60
Sammy Sosa	63
Sammy Sosa	64
Sammy Sosa	66

Stem	Leaf
5	8 9
6	0 1 3 4 5 6
7	0 3

5|8 = 58 home runs

EXAMPLE Interpret Data

2 MEXICO The stem-and-leaf plot lists the percent of people in each state in 2004 that were born in Mexico, rounded to the nearest whole number.

Stem	Leaf
0	0 0 0 1 1 2 2 3 4 4 5 5 5 6 6 8 8 8
1	0 1 4 4 7
2	1 2 3 8
3	1 2 3 5 5 9 9
4	0 1 2 3 3 3 4 6 8
5	2 6 6
6	4 6
7	4

3|1 = 31%

a. Which interval contains the most percentages?

Most of the percentages occur in the _____ interval.

b. What is the greatest percent of people living in one U.S. state that were born in Mexico?

The greatest percent of people living in one U.S. state born in Mexico is _____.

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c. What is the median percent of people living in one U.S. state that were born in Mexico?
The median percent of people living in one U.S. state born in Mexico is _____.

Check Your Progress **Refer to the stem-and-leaf plot in Example 2.**

a. What is the range of the data? _____.

b. What is the least percent of people living in one U.S. state that were born in Mexico? _____.

c. What percentages occur most often? _____

BUILD YOUR VOCABULARY (pages 273–274)

A _____ **stem-and-leaf plot** can be used to compare a set of data.

EXAMPLE Compare Data

1 AGRICULTURE **The yearly production of honey in California and Florida is shown for the years 2000 to 2004, in millions of pounds.**

California	Stem	Florida
7	1	4
8 4	2	0 0 2 4
2 1	3	
2|3 = 32 million lb		*2|0 = 20 million lb*

a. What state produces the most honey?

California: 17 + 24 + 28 + 31 + 33 = _____ million lb

Florida: 14 + 20 + 20 + 22 + 24 = _____ million lb

_____ produces the most honey.

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b. Which state has the most varied production? Explain.

The data for _____ are more spread out, while the data for _____ are clustered. So, _____ has the most varied production.

Check Your Progress **BABY-SITTING** The amount of money Hanna and Jasmine earned baby-sitting in 2006 is shown in the back-to-back stem-and-leaf plot.

Hanna	Stem	Jasmine
0 0	1	0 2 3 5
0 0 2 2 5 5 8	2	0 0 5
0	3	0 2
	4	0
0|2 = $20		*2|5 = $25*

a. Who earned more money baby-sitting?

b. Who has the most varied earnings? Explain.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

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11–8 Select an Appropriate Display

Standard 7SDP1.1 Know various forms of display for data sets, including stem-and-leaf plot or box-and-whisker plot; use the forms to display a single set of data or to compare two sets of data.

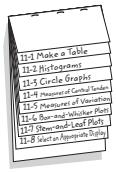
MAIN IDEA

- Choose an appropriate display for a set of data.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 11–8, make a table of data from your science or social studies textbook. Draw a circle graph and bar graph displaying the data. Discuss which graph is most appropriate.



EXAMPLES Choose an Appropriate Display

Choose an appropriate type of display for each situation. Then make a display.

1 FARMS Select an appropriate display to show the acreage of farms in Maine. Justify your answer.

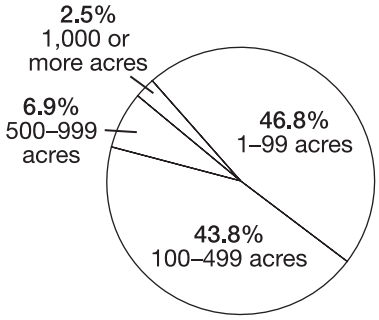
Farms in Maine by Size	
1–99 acres	46.8%
100–499 acres	43.8%
500–999 acres	6.9%
1,000 or more acres	2.5%

Source: ers.usda.gov

This data deals with percents that have a sum of [ ].

A [ ] would be a good way to show percents.

Farms in Maine by Size



2 SCHOOLS Select an appropriate display to show students' favorite school subjects. Justify your reasoning. Then construct the display.

Favorite School Subject	
math	𝍸 𝍸 𝍸 ||
history	𝍸 |||
science	𝍸 𝍸
English	𝍸 ||
other	𝍸 |

In this case, there are specific categories. If you want to show the specific number, use a [ ] or a [ ].

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Remember It



There are many ways to display the same data. However, often one of those ways makes the data easier to understand than do the other ways.

Check Your Progress

a. Select an appropriate display to show favorite types of television programs. Justify your answer. Then construct the display.

Favorite Type of Television Program	
sitcom	54%
reality	22%
news	10%
game show	8%
cartoon	6%

b. Select an appropriate display to show students' favorite hobbies. Then construct the display.

Hobby	Number of Students
reading	10
sports	5
listening to music	10
photography	7
other	18

Homework Assignment

Page(s):

Exercises:

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CHAPTER 11

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 11 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 11, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 273–274*) to help you solve the puzzle.

11-1
Problem-Solving Investigation: Make a Table

1. MONEY The list shows weekly allowances for a group of 13- and 14-year-olds. Organize the data in a table using intervals \$2.01–\$3.00, \$3.01–\$4.00, \$4.01–\$5.00, and so on. What is the most common interval of allowance amounts?

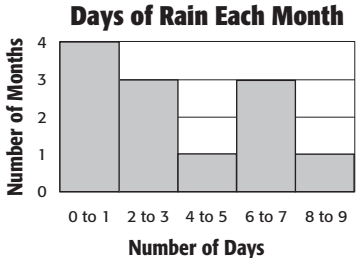
\$2.50	\$3.00	\$3.75	\$4.25	\$4.25
\$4.50	\$4.75	\$4.75	\$5.00	\$5.00
\$5.00	\$5.00	\$5.50	\$5.50	\$5.75
\$5.80	\$6.00	\$6.00	\$6.00	\$6.50
\$6.75	\$7.00	\$8.50	\$10.00	\$10.00
\$12.00	\$15.00			

11-2
Histograms

Use the histogram at the right.

2. How many months have less than two days of rain? ____

3. How many months had between two and seven days of rain? ____

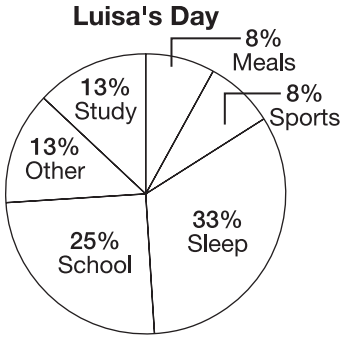


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11-3

Circle Graphs

Use the circle graph at the right.



4. What percent of her time does Luisa spend studying? _____

5. How many degrees are in the section that represents sports?

_____

11-4

Measures of Central Tendency

6. Name the three most common measures of central tendency.

_____

7. Which measure of central tendency best represents the data? Why? 9, 9, 20, 22, 25, 27

_____

11-5

Measures of Variation

Complete.

8. Measures of variation describe the _____ of data.

9. The _____ of a set of data is the difference between the greatest and the least numbers in the set.

10. The _____ range is the difference between the upper and lower quartiles.

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11-6

Box-and-Whisker Plots

11. Draw a box-and-whisker plot for the data. 1, 1, 1, 2, 3, 3, 4, 5, 5

11-7

Stem-and-Leaf Plots

FOOTBALL For Exercises 12–14, use the all-time interception leaders data shown at the right.

All-Time NFL Interception Leaders (through 2005)

Stem	Leaf
5	7 7 7 7 7 8
6	2 2 3 5 8
7	1 9
8	1

5|2 = 62 interceptions

12. What is the most interceptions by an NFL player through 2005?

13. How many NFL players have 57 interceptions through 2005?

14. What is the median number of interceptions among the leaders represented in the stem-and-leaf plot?

11-8

Select an Appropriate Display

Choose the letter that best matches the type of display to its use.

15. Line Graph

16. Bar Graph

17. Histogram

18. Line Plot

a. shows the frequency of data that has been organized into equal intervals

b. shows the number of items in specific categories in the data using bars

c. shows change over a period of time

d. shows how many times each number occurs in the data

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CHAPTER 11 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 11.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 11 Practice Test on page 621 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 11 Study Guide and Review on pages 616–620 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 11 Practice Test on page 621.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 11 Foldable.
- Then complete the Chapter 11 Study Guide and Review on pages 616–620 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 11 Practice Test on page 621.

Student Signature

Parent/Guardian Signature

Teacher Signature

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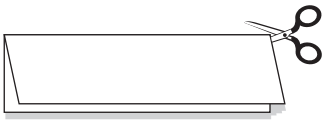
CHAPTER 12

Probability

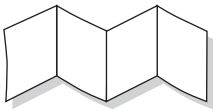
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain sheet of 11" × 17" paper.

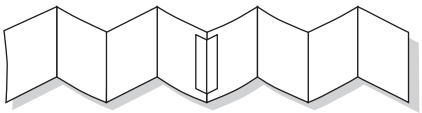
STEP 1 **Fold** the sheet in half lengthwise. Cut along the fold.



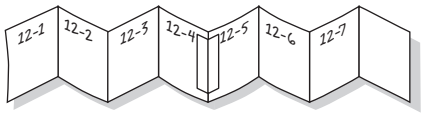
STEP 2 **Fold** each half in quarters along the width.



STEP 3 **Unfold** each piece and tape to form one long piece.



STEP 4 **Label** each page with a key topic as shown. Refold to form a booklet.



NOTE-TAKING TIP: It helps to take notes as you progress through studying a subject. New concepts often build upon concepts you have just learned in a previous lesson. If you take notes as you go, you will know what you need to know for the concept you are now learning.

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CHAPTER 12

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 12. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
biased sample			
composite experiment			
convenience sample			
dependent events			
event			
experimental probability			
Fundamental Counting Principle			
independent events			
outcome			

(continued on the next page)

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Vocabulary Term	Found on Page	Definition	Description or Example
population			
probability			
random			
sample			
sample space			
simple random sample			
stratified random sample			
systematic random sample			
theoretical probability			
tree diagram			
unbiased sample			
voluntary response sample			

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12–1 Counting Outcomes

Reinforcement of Standard 6SDP3.1 Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, **tree diagrams) and express the theoretical probability of each outcome.**

Main Idea

- Count outcomes by using a tree diagram or the Fundamental Counting Principle.

Build Your Vocabulary (pages 303–304)

A **tree diagram** is a diagram used to show the _____ number of _____ in a probability experiment.

The **Fundamental Counting Principle** uses _____ of the number of ways each event in an experiment can occur to find the number of _____ in a sample space.

Write It

How is using a tree diagram to find total number of outcomes like using a factor tree to find prime factors? (see factor trees in Prerequisite Skills page 664)

_____

_____

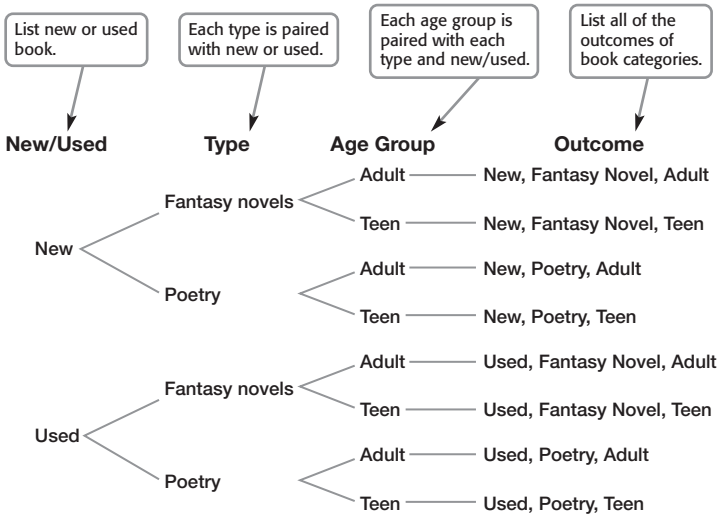
_____

_____

_____

Example 1 Use a Tree Diagram

BOOKS A flea market vendor sells new and used books for adults and teens. Today she has fantasy novels and poetry collections to choose from. Draw a tree diagram to determine the number of categories of books.



There are _____ different categories.

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KEY CONCEPT

Fundamental Counting Principle If event *M* an occur in *m* ways and is followed by event *N* that can occur in *n* ways, then the event *M* followed by the event *N* can occur in $m \cdot n$ ways.

Check Your Progress A store has spring outfits on sale. You can choose either striped or solid pants. You can also choose green, pink, or orange shirts. Finally, you can choose either long-sleeved shirts or short-sleeved shirts. Draw a tree diagram to determine the number of possible outfits.

EXAMPLE **Use the Fundamental Counting Principle**

2 RESTAURANTS **A manager assigns different codes to all the tables in a restaurant to make it easier for the wait staff to identify them. Each code consists of the vowel A, E, I, O, or U, followed by two digits from 0 through 9. How many codes could the manager assign using this method?**

number of possible numbers for the first place	×	number of possible numbers for the second place	×	number of possible numbers for the third place	=	number of possible codes
☐	×	☐	×	☐	=	☐

There are ☐ possible codes.

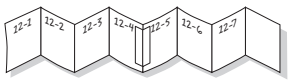
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Check Your Progress A middle school assigns each student a code to use for scheduling. Each code consists of a letter, followed by two digits from 0 though 9. How many codes are possible?

FOLDABLES

ORGANIZE IT

Under *Tree Diagram* and *Fundamental Counting Principle*, write notes on what you learned about counting outcomes by using a tree diagram and by using the Counting Principle. Include examples of each.



EXAMPLE **Find Probability**

3 COMPUTERS **What is the probability that Liana will guess her friend's computer password on the first try if all she knows is that it consists of three letters?**

Find the number of possible outcomes. Use the Fundamental Counting Principle.

choices for the fist letter	×	choices for the second letter	×	choices for the third letter	=	total number of outcomes
	×		×		=	

There are _____ possible outcomes. There is _____ correct password. So, the probability of guessing on the first try is _____.

Check Your Progress What is the probability that Shauna will guess her friend's locker combination on the first try if all she knows is that it consists of three digits from 0 through 9?

HOMEWORK ASSIGNMENT

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12–2 Probability of Compound Experiments

Reinforcement of Standard 6SDP3.1 Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and **express the theoretical probability of each outcome.**

MAIN IDEA

- Find the probability of independent and dependent events.

BUILD YOUR VOCABULARY (pages 303–304)

A **compound event** consists of _____ simple events.

Independent events are _____ events in which the outcome of one event _____ affect the outcome of the other events.

KEY CONCEPT

Probability of Two Independent Events
The probability of two independent events can be found by multiplying the probability of the first event by the probability of the second event.

EXAMPLE **Probability of Independent Events**

1 **The two spinners below are spun. What is the probability that both spinners will show a number greater than 6?**





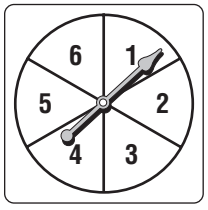
P(first spinner is greater than 6) = _____

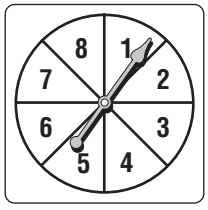
P(second spinner is greater than 6) = _____

P(both spinners are greater than 6) = $\frac{3}{10} \cdot \frac{3}{10}$ or _____

Check Your Progress The two spinners below are spun. What is the probability that both spinners will show a number less than 4?

_____





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EXAMPLE

2 STANDARDS EXAMPLE **A red number cube and a white number cube are rolled. The faces of both cubes are numbered from 1 to 6. What is the probability of rolling a 3 on the red number cube and rolling the number 3 or less on the white number cube?**

A $\frac{1}{2}$ **B** $\frac{1}{6}$ **C** $\frac{1}{9}$ **D** $\frac{1}{12}$

Read the Test Item

You are asked to find the probability of rolling a 3 on the red number cube and rolling a number 3 or less on the white number cube. The events are _____ because rolling one number cube _____ affect rolling the other cube.

Solve the Test Item

First, find the probability of each event.

P(rolling a 3 on the red number cube) = _____

P(rolling 3 or less on the white number cube) = _____

Then, find the probability of both events occurring.

P(3 red and 3 or less white) = _____ · _____ $P(A \text{ and } B) = P(A) \cdot P(B)$

= _____ Multiply.

The probability is _____, which is _____.

Check Your Progress **STANDARDS EXAMPLE** A white number cube and a green number cube are rolled. The faces of both cubes are numbered from 1 to 6. What is the probability of rolling an even number on the white number cube and rolling a 3 or a 5 on the green number cube?

F $\frac{1}{12}$ **G** $\frac{1}{6}$ **H** $\frac{1}{3}$ **J** $\frac{1}{2}$

KEY CONCEPT

Probability of Two Dependent Events
If two events, A and B, are dependent, then the probability of both events occurring is the product of the probability of A and the probability of B after A occurs.

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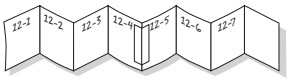
BUILD YOUR VOCABULARY (pages 303–304)

If the outcome of one event does _____ the outcome of another event, the compound events are called **dependent events.**

FOLDABLES™

ORGANIZE IT

Under *Independent Events* and *Dependent Events*, write what you learned about how to find the probability of independent and dependent events.



EXAMPLE Probability of Dependent Events

3 **There are 4 red, 8 yellow, and 6 blue socks mixed up in a drawer. Once a sock is selected, it is not replaced. Find the probability of reaching into the drawer without looking and choosing 2 blue socks.**

Since the first sock _____ replaced, the first event affects the second event. These are dependent events.

P(first sock is blue) = _____ ← number of blue socks / ← total number of socks

P(second sock is blue) = _____ ← number of blue socks after one blue sock is removed / ← Total number of socks after one blue sock is removed

P(two blue socks) = _____ or _____

Check Your Progress There are 6 green, 9 purple, and 3 orange marbles in a bag. Once a marble is selected, it is not replaced. Find the probability that two purple marbles are chosen.

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12–3 Experimental and Theoretical Probability



Reinforcement of Standard 6SDP3.2 Use data to estimate the probability of future events (e.g., batting averages or number of accidents per mile driven).

MAIN IDEA

- Find experimental probability.

BUILD YOUR VOCABULARY (pages 303–304)

A probability that is based on _____ obtained by conducting an _____ is called an **experimental probability.**

A probabililty that is based on _____ _____ is called a **theoretical probability.**

EXAMPLES **Experimental Probability**

Nikki is conducting an experiment to find the probability of getting various results when three coins are tossed. The results of her experiment are given in the table.

Result	Number of Tosses
all heads	6
two heads	32
one head	30
no heads	12

1 What is the theoretical probability of tossing all heads on the next turn?

The theoretical probability is _____ = _____.

2 According to the experimental probability, is Nikki more likely to get all heads or no heads on the next toss?

Based on the results so far, _____ heads is more likely.

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Check Your Progress

Marcus is conducting an experiment to find the probability of getting various results when four coins are tossed. The results of his experiment are given in the table.

Result	Number of Tosses
all heads	6
three heads	12
two heads	20
one head	7
no heads	5

a. What is the theoretical probability of tossing all tails on the next turn?

b. According to the experiment probability, is Marcus more likely to get all heads or no heads on the next toss?

EXAMPLE **Experimental Probability**

3 **MARKETING** **Eight hundred adults were asked whether they were planning to stay home for winter vacation. Of those surveyed, 560 said that they were. What is the experimental probability that an adult planned to stay home for winter vacation?**

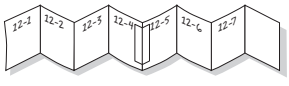
There were ____ people surveyed and ____ said that they were staying home.

The experimental probability is ____ or ____.

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Under *Experimental Probability*, write a few words to compare and contrast experimental and theoretical probabilities.



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Check Your Progress Five hundred adults were asked whether they were planning to stay home for New Year's Eve. Of those surveyed, 300 said that they were. What is the experimental probability that an adult planned to stay home for New Year's Eve?

EXAMPLE **Use Probability to Predict**

4 **MATH TEAM** **Over the past three years, the probability that the school math team would win a meet is $\frac{3}{5}$. Is this probability experimental or theoretical? Explain.**

This is an experimental probability since it is based on what happened in the ____.

If the team wants to win 12 more meets in the next 3 years, how many meets should the team enter?

This problem can be solved using a proportion.

3 out of 5 meets were wins → $\frac{3}{5} \times \frac{12}{x}$ ← 12 out of x meets should be wins.

Solve the proportion.

$\frac{3}{5} = \frac{12}{x}$ Write the proportion.

____ = ____ Find the cross products.

____ = ____ Multiply.

____ = ____ Divide each side by ____.

$x =$ ____

They should enter ____ meets.

REVIEW IT

Explain what a proportion is and how you can solve a proportion. *(Lesson 4-3)*

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Check Your Progress **Over the past three years, the probability that the school speech and debate team would win a meet is $\frac{4}{5}$.**

a. Is this probability experimental or theoretical? Explain.

b. If the team wants to win 20 more meets in the next 3 years, how many meets should the team enter?

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12–4 Problem-Solving Investigation: Act It Out

EXAMPLE Act it Out

MAIN IDEA

- Solve problems by acting them out.

Standard 7MR2.5 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
Reinforcement of Standard 6SDP3.2 Use data to estimate the probability of future events (e.g., batting averages or number of accidents per mile driven).

Melvin paid for a $5 sandwich with a $20 bill. The cashier has $1, $5, and $10 bills in the register. How many different ways can Melvin get his change?

EXPLORE You know that Melvin should receive $20 – $5 or ____ in change. You need to determine how many different ways the cashier can make $15 in change with $1, $5, and $10 bills.

PLAN Use manipulatives such as play money to act out the problem. Record the different ways the cashier can make $15 in change.

SOLVE

	$1	$5	$10
Method 1		1	1
Method 2			1
Method 3			
Method 4			
Method 5			
Method 6			

The cashier can make the change in ____ different ways.

CHECK Make sure each method adds up to ____ in change.

Check Your Progress **SHOPPING** Amanda paid for an $8 CD with a $20 bill. The cashier has $1, $5, and $10 bills in the register. How many different ways can Amanda get her change?

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12–5 Using Sampling to Predict



Reinforcement of Standard 6SDP2.5 Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.

MAIN IDEA

- Predict the actions of a larger group by using a sample.

BUILD YOUR VOCABULARY (pages 303–304)

A **sample** is a _____ selected group chosen for the purpose of collecting data.

The **population** is the _____ from which the samples under consideration are taken.

An **unbiased sample** is selected so that it is _____ of the entire population.

In a **stratified random sample,** the population is divided into _____, nonoverlapping groups.

In a **systematic random sample,** the items or people are selected according to a specific _____ or item interval.

In a **biased sample,** one or more parts of the population are _____ over others.

EXAMPLES Determine Validity of Conclusions

Determine whether each conclusion is valid. Justify your answer.

1 **To determine which school lunches students like most, the cafeteria staff surveyed every tenth student who walk into the cafeteria. Out of 40 students surveyed, 19 students stated that they liked the burgers best. The cafeteria staff concludes that about 50% of the students like burgers best.**

The conclusion is _____. Since the population is the students of the school, the sample is a _____ _____. It is _____.

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2 **To determine what sports teenagers like, Janet surveyed the student athletes on the girls' field hockey team. Of these, 65% said that they like field hockey best. Janet concluded that over half of teenagers like field hockey best.**

The conclusion is _____. The students surveyed probably prefer field hockey. This is _____.

The sample is _____ because the people are easily accessed.

Check Your Progress **Determine whether each conclusion is valid. Justify your answer.**

a. To determine what ride is most popular, every tenth person to walk through the gates of a theme park is surveyed. Out of 290 customers, 98 stated that they prefer The Zip. The park manager concludes that about a third of the park's customers prefer The Zip.

b. To determine whether people prefer dogs or cats, a researcher surveys 80 people at a dog park. Of those surveyed, 88% said that they prefer dogs, so the researcher concludes that most people pet owners prefer dogs.

EXAMPLE **Using Sampling to Predict**

3 **BOOKS** **The student council is trying to decide what types of books to sell at its annual book fair to help raise money for the eighth-grade trip. It surveys 40 students at random. The books they prefer are in the table. If 220 books are to be sold at the book fair, how many should be mysteries?**

Book Type	Number of Students
mystery	12
adventure novel	9
sports	11
short stories	8

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First, determine whether the sample method is valid. The sample is _____ since the students were randomly selected. Thus, the sample _____.

$\frac{12}{40}$ or _____ of the students prefer mysteries. So, find _____.

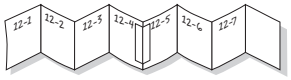
$0.30 \times$ _____ = _____

About _____ books should be mysteries.

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ORGANIZE IT

Under *Sampling*, list the different types of samples and how to use them to make predictions. Give examples.



Check Your Progress The student shop sells pens. It surveys 50 students at random. The pens they prefer are in the table. If 300 pens are to be sold at the student shop, how many should be gel pens?

Type	Number
gel pens	22
ball point	8
glitter	10
roller balls	10

HOMEWORK ASSIGNMENT

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CHAPTER 12

BRINGING IT ALL TOGETHER

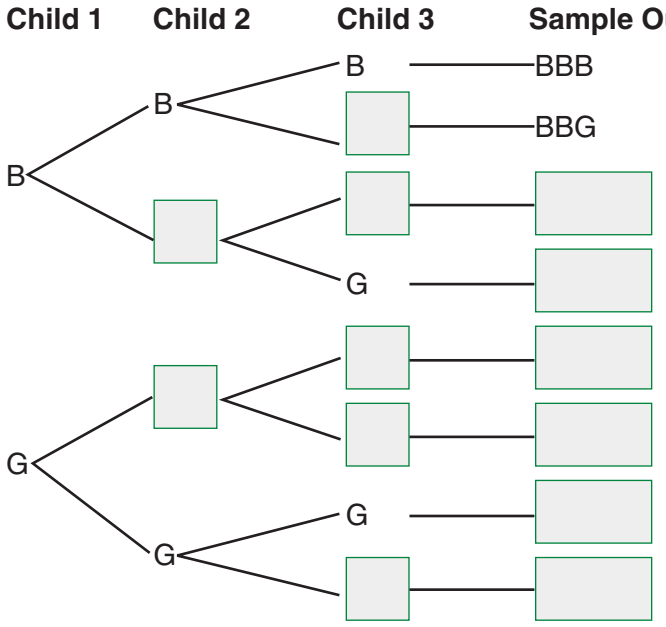
STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 12 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 12, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 197–198*) to help you solve the puzzle.

12-1

Counting Outcomes

1. Complete the tree diagram shown below for how many boys and and how many girls are likely to be in a family of three children.



2. Use the Fundamental Counting Principle to find the number of possible outcomes if there are 4 true-false questions on a test.

$\square \times \square \times \square \times \square = \square$

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12-2

Probability of Compound Experiments

3. What is a compound event?

4. Are the events of spinning a spinner and rolling a number cube independent events? Why or why not?

A number cube is rolled and a penny is tossed. Find each probability.

5. P(4 and tails)

6. P(3 or less, heads)

12-3

Experimental and Theoretical Probability

The table at the right shows the results of a survey.

Item	Number of People
balloons	75
cards	15
decorations	25
cake	50

7. How many people bought balloons?

8. How many people were surveyed?

9. What is the experimental probability that a person surveyed preferred balloons?

10. A bag contains 15 red marbles, 25 purple marbles, and 10 yellow marbles. Describe an experiment that you could conduct with the marbles to find an experimental probability.

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12-4

Problem-Solving Investigation: Act It Out

11. **SPORTS** There are 32 tennis players in a tournament. If each losing player is eliminated from the tournament, how many tennis matches will be played during the tournament?

12-5

Using Sampling to Predict

12. What you conduct a survey by asking ten students selected at random from each grade at your school what their favorite class is, what type of random sample have you taken?

13. A grocery store owner asks the shoppers in his store where they prefer to shop for groceries. What type of sample has he conducted?

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CHAPTER 12 Checklist

ARE YOU READY FOR THE CHAPTER TEST?



Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 12.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 12 Practice Test on page 657 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 12 Study Guide and Review on pages 653–656 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 12 Practice Test on page 657.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 12 Foldable.
- Then complete the Chapter 12 Study Guide and Review on pages 653–656 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 12 Practice Test on page 657.

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